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Aditya Ranjan Sir

(Excise Inspector)

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S.N.	Exam Name	Year	No. of Ques.
1.	SSC CGL TIER-I	2024, 2023, 2022, 2021, 2020, 2019, 2018	2027
2.	SSC CGL TIER-II	2024, 2023, 2022, 2021, 2020, 2019, 2018	855
3.	SSC CHSL TIER-I	2024, 2023, 2022, 2021, 2020	1756
4.	SSC CHSL TIER-II	2024, 2023, 2022	120
5.	SSC CPO TIER-I	2024, 2023, 2022, 2021, 2020	834
6.	SELECTION POST	2024, 2023, 2022, 2021 PHASE (XII, XI, X, IX)	534
7.	SSC MTS TIER-I	2023, 2022, 2021, 2020	333
	TOTAL NUMBER OF QUESTIONS		6,459

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		If $\mathrm{cosec}\theta - \cot\theta = K$, Then
		$\mathrm{cosec}\theta + \cot\theta = 1/K$
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			Total	423		
			Grand Total	6459		

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01 Chapter

PERCENTAGE

◆ TYPE – I ◆ BASIC QUESTIONS

1. 12.75% is equivalent to ________.
SSC CHSL 03/07/2024 (Shift-03)
(a) $\frac{17}{200}$ (b) $\frac{41}{400}$
(c) $\frac{51}{400}$ (d) $\frac{37}{400}$

2. 5% of 2% of 3 is equal to:
SSC CHSL 08/07/2024 (Shift-04)
(a) 0.03 (b) 0.3
(c) 3 (d) 0.003

3. Which of the following is the least ?
SSC CGL 26/07/2023 (Shift-01)
(a) 12% of 625 (b) 15 % of 555
(c) 10% of 720 (d) 9% of 845

4. If 10% of 24% of x is 240,then x = ?
SSC CHSL 11/07/2024 (Shift-04)
(a) 10000 (b) 100
(c) 1000 (d) 100000

5. If 45% of 50% of a number is 27, then what is the number?
SSC Phase XII 26/06/2024 (Shift-02)
(a) 160 (b) 180
(c) 150 (d) 120

6. By how much is 60% of 75 greater than $\frac{1}{5}$ of 25?
SSC CGL TIER-II (18/01/2025)
(a) 37 (b) 38
(c) 40 (d) 34

7. What is the ratio between S and T if S is 75% of T?
SSC CPO 28/06/2024 (Shift-03)
(a) 4 : 3 (b) 2 : 3
(c) 75 : 1 (d) 3 : 4

8. If 18 toys out of 75 toys are for boys and the rest are for girls, what is the percentage of girls toys?
SSC CHSL 01/07/2024 (Shift-02)
(a) 18% (b) 67%
(c) 57% (d) 76%

9. In a class, the numbers of boys and girls are in the ratio of 3 : 5. What is the percentage of boys in the class?
SSC CPO 27/06/2024 (Shift-02)
(a) 37.5% (b) 60%
(c) 42.5% (d) 12.5%

10. The cost price of an item increased from ₹2,500 to ₹3,000. Find the increase percentage.
SSC CHSL 01/07/2024 (Shift-03)
(a) 15% (b) 20%
(c) 30% (d) 25%

11. If a person's salary increases from ₹200 per day to ₹234 per day, then the percentage increase in the person's salary is:
SSC CHSL 09/07/2024 (Shift-03)
(a) 15% (b) 17%
(c) 14% (d) 16%

12. Mahesh's annual salary increased from ₹2,00,000 to ₹2,40,000. Find the percentage increase in the salary.
SSC CHSL 02/07/2024 (Shift-01)
(a) 22% (b) 20%
(c) 24% (d) 18%

13. Shantanu's income decreased from Rs 42,800 to Rs.37,236. Find the percentage decrease in his income.
SSC CHSL 04/07/2024 (Shift-01)
(a) 13% (b) 14%
(c) 11% (d) 12%

14. Monthly expenditure of Ritvik decreases from ₹12,800 to ₹11,712. Find the percentage decrease in his expenditure.
SSC CHSL 03/07/2024 (Shift-01)
(a) 9.25% (b) 6.25%
(c) 7.7% (d) 8.5%

15. Last year, Ranjan's monthly salary was ₹34,500 and this year his monthly salary is ₹38,640. What is the percentage increase in Ranjan's monthly salary this year over his monthly salary last year?
SSC CHSL 04/07/2024 (Shift-02)
(a) 15% (b) 13%
(c) 12% (d) 20%

16. Shiya invests ₹1,53,000, which is 30% of her annual income, in mutual funds. What is her monthly income (in ₹)?
SSC CPO 28/06/2024 (Shift-02)
(a) 52300 (b) 45800
(c) 55600 (d) 42500

16. An interval of 2 hours 25 minutes is wrongly estimated by 2 hours 30.5 minutes. The error percentage is:
SSC CHSL 08/07/2024 (Shift-01)
(a) $2\frac{21}{29}\%$ (b) $3\frac{19}{29}\%$
(c) $3\frac{23}{29}\%$ (d) $2\frac{27}{29}\%$

18. The population of a city was 5000000 in 2020. The population grows 7.5% annually. The population in 2022 is
SSC CHSL 01/07/2024 (Shift-04)
(a) 5778125 (b) 5875215
(c) 5558875 (d) 5887125

19. After an increase of 9% in salary, a person received ₹6,300. What was his salary before the increase (consider integer part only)?
SSC CHSL 10/07/2024 (Shift-02)
(a) ₹5,000 (b) ₹5,779
(c) ₹3,879 (d) ₹4,000

20. R gives $\frac{3}{8}$ of the toffees he has to S. If now R has k% of the toffies with S, then find the value of k.
SSC CHSL 05/07/2024 (Shift-03)
(a) $\frac{200}{3}$ (b) $\frac{500}{3}$
(c) 140 (d) 200

21. If 30% of Ravi's income is equal to 40% of Suresh's income, then 50% of Ravi's income is equal to what percentage of Suresh's income?
SSC CPO 05/10/2023 (Shift-03)
(a) $66\frac{2}{3}\%$ (b) $33\frac{2}{3}\%$
(c) $66\frac{1}{3}\%$ (d) $33\frac{1}{3}\%$

22. A number increased by 20% gives 240. Find the number.
SSC CHSL 11/07/2024 (Shift-01)
(a) 200 (b) 280
(c) 240 (d) 250

23. When a number is increased by 8, it becomes 120% of itself. The number is:
SSC CHSL 02/07/2024 (Shift-02)
(a) 30 (b) 60
(c) 40 (d) 50

24. When 12 is subtracted from a number, it reduces to its 40%. Two-fifth of that number is:
SSC CHSL 10/07/2024 (Shift-02)
(a) 20 (b) 12
(c) 8 (d) 50

25. If 70 is subtracted from 70% of a number, the remainder is 70. What is the number?
SSC Phase XII 24/06/2024 (Shift-02)
(a) 400 (b) 100
(c) 300 (d) 200

26. Two numbers are, respectively, 10% and 25% more than the third number. The ratio of the two numbers is:
SSC CGL Tier II 02/03/2023
(a) 22 : 25 (b) 19 : 25
(c) 23 : 25 (d) 18 : 25

27. Two numbers are respectively 61% and 35% less than a third number. The first number is what percentage of the second number?
SSC CHSL 10/07/2024 (Shift-04)
(a) 60% (b) 24%
(c) 48% (d) 30%

28. In an engineering college, there are four branches namely Computer Science (CS), Electronics (EC), Civil (CE), and Mechanical (ME). The respective ratio of the number of students in these branches is 11 : 5 : 6 : 7. What is the percentage of students belonging to CS and ME branches in the college (correct up to two decimal places)?

SSC CHSL 03/07/2024 (Shift-04)

(a) 61.07% (b) 62.07%
(c) 62.37% (d) 61.37%

29. What is the number which needs to be added to 20% of 460 to have the sum as 70% of 920?

SSC CHSL 02/07/2024 (Shift-03)

(a) 335 (b) 762
(c) 926 (d) 552

30. If the income of P is 40% less than Q, then the combined income of P and Q is how much per cent more than the income of P?

SSC CHSL 03/07/2024 (Shift-03)

(a) $166\frac{2}{3}\%$ (b) $164\frac{1}{3}\%$
(c) $166\frac{1}{3}\%$ (d) $164\frac{2}{3}\%$

31. To increase a number by 25%, by what number should that number be multiplied?

SSC CGL 07/03/2020 (Shift-03)

(a) 3 (b) $\frac{2}{5}$
(c) $\frac{5}{4}$ (d) $\frac{3}{4}$

32. A man multiplied a number by $\frac{8}{5}$ instead of $\frac{5}{8}$. What is the percentage error in the calculation?

SSC MTS 13/06/2023 (Shift-02)

(a) 124% (b) 162%
(c) 156% (d) 100%

33. A quantity $\frac{4}{5}$ is changed to $\frac{5}{6}$. How much percentage change is given to the quantity?

SSC CHSL 05/07/2024 (Shift-03)

(a) 4.73% (b) 4.71%
(c) 4.17% (d) 4.37%

34. A pupil multiplied a figure by $\frac{3}{5}$ rather than $\frac{5}{3}$. What is the percentage error in the calculation?

SSC CHSL 24/05/2022 (Shift-01)

(a) 64 (b) 47
(c) 58 (d) 52

35. By mistake, the reciprocal of a positive fraction got typed in place of itself, and thereby its value got reduced by 175/4%. What was the value of the fraction?

SSC CGL 24/08/2021 (Shift-03)

(a) $\frac{1}{2}$ (b) $\frac{4}{3}$
(c) $\frac{3}{4}$ (d) $\frac{1}{4}$

36. A fraction $\frac{3}{5}$ is decreased by $\frac{2}{5}$. The resulting fraction is then increased by 20%. What is the percentage decrease/increase in the value of the original fraction?

SSC CHSL 03/07/2024 (Shift-02)

(a) Increase 60%
(b) Decrease 50%
(c) Increase 50%
(d) Decrease 60%

37. In a sweet, one-third is sugar. If the price of sugar now is $\frac{7}{6}$ of the previous price, what is the effective percentage increase in the cost of the sweet?

SSC CPO 29/06/2024 (Shift-03)

(a) $\frac{100}{9}\%$ (b) $\frac{100}{5}\%$
(c) $\frac{100}{18}\%$ (d) $\frac{100}{3}\%$

38. Ramesh spent ₹30,000 on Diwali shopping and ₹45,000 on buying a TV set, and the remaining 40% of the total amount he had as cash with him. What was the total amount (in ₹)?

SSC CPO 29/06/2024 (Shift-03)

(a) 1,22,000 (b) 1,25,000
(c) 1,35,000 (d) 1,10,000

39. If the numerator of a fraction is increased by 12% and is denominator is reduced by 8%. It gives a new fraction $\frac{16}{17}$, What is the original fraction?

SSC Phase-XI 27/06/2023 (Shift-03)

(a) $\frac{92}{119}$ (b) $\frac{23}{28}$
(c) $\frac{28}{23}$ (d) $\frac{119}{92}$

40. If the numerator of a fraction is increased by 140% and the denominator of the fraction is decreased by 20%, the resultant fraction is 12/7. Find the original fraction.

SSC CHSL 17/03/2023 (Shift-02)

(a) $\frac{4}{9}$ (b) $\frac{4}{7}$
(c) $\frac{7}{6}$ (d) $\frac{8}{9}$

41. If the Numerator of a fraction be increased by 50% and its denominator be diminished by 28%, the value of the fraction is $\frac{25}{36}$. Find the original fraction.

SSC CHSL 24/05/2022 (Shift-03)

(a) $\frac{1}{5}$ (b) $\frac{2}{3}$
(c) $\frac{2}{5}$ (d) $\frac{1}{3}$

42. If the numerator of a fraction is increased by 60% and the denominator is increased by 40%, then the resultant fraction is $\frac{16}{63}$. The original fraction is:

SSC CPO 25/11/2020 (Shift-02)

(a) $\frac{2}{9}$ (b) $\frac{5}{9}$
(c) $\frac{2}{11}$ (d) $\frac{4}{9}$

◆ TYPE – II ◆
AB RULE

43. The salary of employees in a factory was reduced by 20% due to economic crisis. In order to have their salary back to original amount, it must be raised by:

SSC CHSL 11/07/2024 (Shift-04)

(a) 25% (b) 20%
(c) 40% (d) 12.5%

44. If Ramu's salary is 30% less than Somu's salary, then by how much percent is Somu's salary more than Ramu's salary?

SSC CHSL 09/07/2024 (Shift-02)

(a) 45.47%
(b) 42.86%
(c) 42.67%
(d) 34.56%

45. Shyam's income is 20% less than Ram's. How much is Ram's income more than Shyam's in percentage terms?

SSC CHSL 11/07/2024 (Shift-02)

(a) 25% (b) 20%
(c) 80% (d) 30%

46. If the income of Neha is 5% more than that of Monica, then the income of Monica is what percentage less than that of Neha?

SSC CHSL 04/07/2024 (Shift-04)

(a) $4\frac{13}{21}\%$ (b) $4\frac{16}{21}\%$
(c) $4\frac{11}{21}\%$ (d) $4\frac{5}{21}\%$

47. Ram's income is 2.5% more than Shyam's income. By what percentage is Shyam's income less than Ram's income?

SSC CGL 26/09/2024 (Shift-03)

(a) 2.43%
(b) 3.43%
(c) 1.43%
(d) 4.43%

48. By what percentage should a racer increase the speed to reduce the time by 25% to cover a fixed distance?

SSC CHSL 11/07/2024 (Shift-01)

(a) $33\frac{1}{3}\%$ (b) $37\frac{1}{3}\%$
(c) 41% (d) 31%

◆ TYPE – III ◆
PERIMETER, AREA & VOLUME

49. The radius of a circle is increased by 20%. Find the percentage increase in the circumference of the circle.

SSC CHSL 14/08/2023 (Shift-02)

(a) 30% (b) 20%
(c) 15% (d) 40%

50. If each side of a cube is decreased by 12%, then the percentage decrease in its total surface area is :

SSC CHSL 10/08/2023 (Shift-02)

(a) 25.66% (b) 28.23%
(c) 22.56% (d) 26.54%

51. If the radius of a sphere is increased by 5%, then by what percentage will the surface area of the sphere increase?

SSC CHSL 08/07/2024 (Shift-01)

(a) 10.25% (b) 15.25%
(c) 13.25% (d) 11.25%

52. The radius of a sphere is increased by 25%. What is the increase per cent in surface area?

SSC CHSL 04/07/2024 (Shift-02)

(a) 15.55% (b) 56.25%
(c) 25.25% (d) 36.45%

53. If the side of a square is increased by 5%, then the percentage increase in its area will be:

SSC CHSL 02/07/2024 (Shift-02)

(a) 10.25% (b) 11%
(c) 10% (d) 10.5%

54. The breadth of a rectangular lawn is decreased by 8% and its length is increased by 15%. Find the percentage change in the lawn area.

SSC CPO 29/06/2024 (Shift-02)

(a) 8.5% increase
(b) 8.5% decrease
(c) 5.8% decrease
(d) 5.8% increase

55. The radius of a circle is increased in such a way that its circumference increases by 7%. As a result, the area of the circle also increases by:

SSC Phase XII 20/06/2024 (Shift-02)

(a) 12.20% (b) 10.28%
(c) 14.49% (d) 18.69%

56. If the length of a rectangle is decreased by 13% and the breadth is increased by 13%, Find the change of percentage in its area.

SSC MTS 16/05/2023 (Shift-03)

(a) 1.69% decrease
(b) 1.69% increase
(c) No change
(d) 13% decrease

57. If radius of a sphere is decreased by 48%, then by what percent does its surface area decrease?

SSC CGL Tier II 02/03/2023

(a) 82.91% (b) 72.96%
(c) 78.98% (d) 86.26%

58. The length and breadth of a rectangle are increased by 8% and 5%, respectively. By how much percentage will the area of the rectangle increase?

SSC CGL 01/12/2022 (Shift-01)

(a) 13.4% (b) 15.4%
(c) 12.4% (d) 16.4%

59. The length and the breadth of a rectangle are made to increase and decrease, respectively, by 8% and 10%. What is the percentage increase or decrease in its area?

SSC CGL 11/04/2022 (Shift-02)

(a) Decrease by 1.8%
(b) Increase by 1.8%
(c) Increase by 2.8%
(d) Decrease by 2.8%

60. The base of a triangle is increased by 40%. By what percentage (correct to two decimal places) should its height be increased so that the area increases by 60%?

SSC CGL 13/04/2022 (Shift-03)

(a) 15.54% (b) 20.01%
(c) 14.28% (d) 18.62%

61. If the radius of a sphere is increased by $16\frac{2}{3}$%, then by what per cent would its surface area increase (correct to one decimal place)?

SSC MTS 27/10/2021 (Shift-02)

(a) 33.9% (b) 35.6%
(c) 34.8% (d) 36.1%

62. Find the percentage increase in surface area of a cube by triple each side.

SSC CHSL 05/07/2024 (Shift-03)

(a) 800% (b) 500%
(c) 700% (d) 650%

63. If the radius of a sphere is doubled, then its surface area will be increased by:

SSC CPO 03/10/2023 (Shift-03)

(a) 200% (b) 100%
(c) 300% (d) 400%

64. If the area of a square is decreased by 19%, then the diagonal of the square is decreased by:

SSC CPO 23/11/2020 (Shift-02)

(a) 15% (b) 12%
(c) 10% (d) 5%

65. If the radius of a sphere is increased by 12%, then the volume will be increased by approximately:

SSC CHSL 03/07/2024 (Shift-03)

(a) 42.5% (b) 45.49%
(c) 40.49% (d) 41.49%

66. If the radius of a sphere is increased by 20%, then find the percentage increase in its volume.

SSC CPO 29/06/2024 (Shift-03)

(a) 70.6% (b) 75.5%
(c) 72.8% (d) 68.5%

67. If the length and breadth of a cuboid are increased by 6% and 8%, respectively, then the percentage increase in its volume (correct to two decimal places) is:

SSC CPO 29/06/2024 (Shift-03)

(a) 13.96% (b) 12.96%
(c) 14.48% (d) 11.48%

68. The radius and height of a right circular cone is increased by 25%. Find the increase in percentage of the volume of the cone (rounded off to 2 decimal places).

SSC CHSL TIER-II 02/11/2023

(a) 94.51% (b) 95.31%
(c) 93.51% (d) 94.31%

69. The diameter of a sphere is increased by 30%. What is the percentage increase in its volume?

SSC CHSL TIER-II 02/11/2023

(a) 90.5% (b) 41.7%
(c) 119.7% (d) 69%

70. If the base radius and the height of a right circular cone are increased by 10%, then the percentage increase in the volume is:

SSC CPO 04/10/2023 (Shift-03)

(a) 33.1% (b) 20.2%
(c) 22.1% (d) 30.2%

71. The length and breadth of a cuboid is increased by 20% and 25%, respectively, while its height is reduced by 30%. What must be the total percentage increase/decrease in the volume of the cuboid?

SSC CGL 07/12/2022 (Shift-03)

(a) Increase by 5%
(b) Increase by 3%
(c) Decrease by 2%
(d) Decrease by 4%

72. The total percentage change in the volume of a cuboid if its length and breadth are decreased by 15% and 25%, respectively, while its height is increased by 60% is:

SSC CPO 29/06/2024 (Shift-02)

(a) 5% decrease
(b) 2% decrease
(c) 5% increase
(d) 2% increase

◆ TYPE – IV ◆
SI ESSIVE PERCENTAGE CHANGE

73. un's salary was decreased by 50% nd subsequently increased by 50%, then how much percent did he lose?

SSC CHSL 01/07/2024 (Shift-01)

(a) 36% (b) 10%
(c) 40% (d) 25%

74. Two successive price increases of 25% and 25% of an article are equivalent to a single price increase of:

SSC CPO 29/06/2024 (Shift-01)

(a) 52.25% (b) 50.25%
(c) 56.25% (d) 48.50%

75. Ravi's salary was increased by 50%. After some time, his new salary was also increased by 50%. Find his gain percentage of salary.

SSC CGL 10/09/2024 (Shift-02)

(a) 125% (b) 100%
(c) 200% (d) 150%

76. The salary of an employee is increased by 10% and then the increased salary is reduced by 10%. The percentage loss in the salary of the employee is:

SSC Phase XII 25/06/2024 (Shift-02)

(a) 1% (b) 3%
(c) 2% (d) 4%

77. A number is increased by 25% and then decreased by 16%, By what percentage is resulting number less than/more than the original number?

SSC CHSL TIER-II 02/11/2023

(a) does not change
(b) decreases by 5%
(c) increases by 5%
(d) decreases by 13%

78. The salary of a worker is first increased by 25%, then it is decreased by 12%. The percentage change in his salary is:

SSC CGL 11/09/2024 (Shift-02)

(a) 10% increase
(b) 13% increase
(c) 10% decrease
(d) 13% decrease

79. In a company, all employees are getting equal wages. If the number of employees is increased by 20% and their wages per head are decreased by 18%, what is the percentage decrease in total wages?

SSC CGL 17/09/2024 (Shift-01)

(a) 2.4% (b) 1%
(c) 1.6% (d) 1.4%

80. If price of an article increases successively by 15% and 10%, respectively, then what is the percentage equivalent to a single price increase of that article?

SSC CHSL 02/07/2024 (Shift-03)

(a) 26.5% (b) 25%
(c) 23.5% (d) 12.5%

81. The population of a town first decreased by 16% due to migration to a big city for better job opportunities. The next year, the population of the town increased by 21% as there were better facilities for jobs. What is the net percentage change (correct to 2 decimal places) in the population?

SSC CHSL 05/07/2024 (Shift-01)

(a) Decrease by 2.54%
(b) Increase by 2.54%
(c) Increase by 1.64%
(d) Decrease by 1.64%

82. A number is first increased by 44% and then decreased by 30%. The net percentage change (rounded off to the nearest integer) in the original number is:

SSC CHSL 05/07/2024 (Shift-02)

(a) Increase by 1%
(b) Decrease by 4%
(c) Increase by 4%
(d) Decrease by 1%

83. The price of an article is first increased by 40% and then decreased by 45%, due to reduction in sales. Find the net percentage change in the final price of the article.

SSC CHSL 02/07/2024 (Shift-03)

(a) –13% (b) 13%
(c) –23% (d) 23%

84. A number is first decreased by 18% and the resulting number is then increased by 25%. What is the overall percentage change in the original number?

SSC CHSL 09/07/2024 (Shift-02)

(a) Decrease by 2.5%
(b) Increase by 3.5%
(c) Increase by 2.5%
(d) Decrease by 3.5%

85. Sumit's income in 2020 was ₹21,000. He gets an increment of 10% every year. What was his income in 2022?

SSC CHSL 01/07/2024 (Shift-04)

(a) ₹25,410 (b) ₹26,530
(c) ₹23,100 (d) ₹29,100

86. Rakesh is the owner of a rectangular field. Because of the construction of an express way near his field, the length and breadth of his field are reduced by 30% and 10%, respectively. What is the percentage decrease in the area of his field?

SSC CHSL 03/07/2024 (Shift-04)

(a) 40% (b) 33%
(c) 37% (d) 35%

87. The price of a product increases by 10% in the first year and 20% in the second year. What is the overall percentage increase in the price of the product over the two years?

SSC CHSL 11/07/2024 (Shift-03)

(a) 28% (b) 32%
(c) 30% (d) 36%

88. Ramesh's pocket money was reduced by 25%, and then the reduced pocket money was increased by 20%. Find the net increase or decrease percentage in his original pocket money.

SSC CHSL 08/07/2024 (Shift-03)

(a) Decrease 12%
(b) Increase 12%
(c) Increase 10%
(d) Decrease 10%

89. The price of a car is decreased by 15% and 20% in two successive years respectively. What percentage of the price of the car is decreased after two years?

SSC CHSL 08/07/2024 (Shift-01)

(a) 32% (b) 15%
(c) 46% (d) 25%

90. The strength of a school increases and decreases every alternate year by 20%. It started with an increase in 2018. What is the strength of the school at the start of 2021 as compared to that of 2018?

SSC Phase XII 25/06/2024 (Shift-03)

(a) Decrease by 16.2%
(b) Increase by 15.2%
(c) Decrease by 15.2%
(d) Increase by 16.2%

91. When the price of an article was increased by 5% its sale reduced by 10%. What was net effect on the revenue?

SSC MTS 04/05/2023 (Shift-03)

(a) 5% increase
(b) 5.5% decrease
(c) 5.5% increase
(d) 5% decrease

92. The price of a car is first increased by 35% and after that the price is decreased by 25% due to reduction in sales. What is the net percentage change in final price of the car?

SSC CPO 11/11/2022 (Shift-02)

(a) Decrease by $2\frac{1}{5}\%$
(b) Increase by $2\frac{1}{3}\%$
(c) Decrease by $1\frac{3}{5}\%$
(d) Increase by $1\frac{1}{4}\%$

93. The price of a scooter increases successively by10%, 5% and 15%. What is the total percentage increase in price of scooter?

SSC CGL 01/12/2022 (Shift-02)

(a) $32\frac{33}{40}\%$ (b) $34\frac{21}{40}\%$
(c) $30\frac{11}{40}\%$ (d) $36\frac{31}{40}\%$

94. Instead of increasing a number successively by 20 percent and 30 percent, it is decreased by 22 percent. Resultant value is what percentage of the required correct value?

SSC CHSL 09/03/2023 (Shift-04)

(a) 55% (b) 60%
(c) 48% (d) 50%

95. The price of an electronic machine decreased by 5%, 10% and 15% during the first three years. What will be the price of the machine after three years if the value at the beginning was Rs.8,000?

SSC CHSL TIER-II (18/11/2024)

(a) Rs.5000 (b) Rs.6721
(c) Rs.7000 (d) Rs.5814

96. A number is first decreased by 10%, then increased by 30% and then further it is decreased by 20%. What is the net decrease percentage in the number?

SSC CPO 28/06/2024 (Shift-01)

(a) $4\frac{1}{5}\%$ (b) $6\frac{2}{5}\%$
(c) $5\frac{3}{5}\%$ (d) $3\frac{4}{5}\%$

97. A number is first increased by 12% and then increased by 23%. The number, so obtained, is now decreased by 34%. What is the net increase or decrease percent in the original number (nearest to an integer)?

SSC CGL 09/09/2024 (Shift-03)

(a) 10% increase (b) 9% decrease
(c) 10% decrease (d) 9% increase

98. The price of an AC increases and decreases in every alternate year by $1\frac{3}{5}$%. It started with an increase in 2004. The price of the AC in 2007, as compared to that in 2004 (correct to two places of decimals):

SSC Phase XII 21/06/2024 (Shift-02)

(a) Decreased by 2.57%
(b) Decreased by 1.57%
(c) Increased by 1.57%
(d) Increased by 2.57%

99. Two successive percentage decrease of 25% each is by what percentage less than two successive percentage increase of 25% each? (Round to two decimal places).

SSC CGL 26/09/2024 (Shift-01)

(a) 50% (b) 43.75%
(c) 22.22% (d) 56.25%

100. Two successive increments of 30% each is by what percentage more than two successive decrements of 30% each? (Correct to two decimal places)

SSC CGL 20/07/2023 (Shift-02)

(a) 32.54% (b) 28.15%
(c) 25.25% (d) 35.29%

101. An investor, invested ₹2,00,000 in shares. The shares rose by 18% on the first day, fell by 15% on the second day, and then fell by 3% on the third day. What is the net percentage increase or decrease in the value of the investor's shares? (Rounded up to one decimal place)

SSC CGL 18/09/2024 (Shift-03)

(a) Increase by 2.2%
(b) Increase by 2.7%
(c) Decrease by 2.7%
(d) Decrease by 2.2%

102. The population of a town is 15000. If the population increases by 15% in the first year, by 25% in the second year and due to pollution it decreases by 6% in the third year, what will be its population after 3 years?(Round off number in answer)

SSC CPO 29/06/2024 (Shift-03)

(a) 20269 (b) 15269
(c) 25269 (d) 28269

103. An employee gets two successive increments in his salary, as a result of which his salary becomes 2.5 times the initial salary. What was his first percentage increment, if the second percentage increment was 4 times as high as the first?

SSC MTS 18/10/2021 (Shift-02)

(a) 25% (b) 50%
(c) 12% (d) 10%

• TYPE – V •
RATIO METHOD

104. If the price of petrol increased by 7%, then by what percentage should the consumption be decreased by the consumer, if the expenditure on petrol remains unchanged?

SSC CGL 19/07/2023 (Shift-04)

(a) $6\frac{58}{107}$% (b) $5\frac{11}{107}$%
(c) $3\frac{49}{107}$% (d) $4\frac{99}{107}$%

105. If price is decreased by 25 percent, then by how much percentage consumption should be increased, so that the expenditure remains the same?

SSC MTS 11/05/2023 (Shift-01)

(a) 20% (b) 40%
(c) 37.5% (d) 33.33%

106. If the price of rice is raised by 20%, then by what percentage should a person reduce his consumption of rice so that his expenditure remains the same? (correct to one decimal place)

SSC CHSL 26/05/2022 (Shift-03)

(a) 14.7% (b) 18.7%
(c) 16.7% (d) 12.7%

107. The price of pulses has increased by 45%. By what percentage (rounded off to the nearest integer) the increased price of the pulses should be reduced so that the price of the pulses remains unaltered?

SSC CHSL 04/07/2024 (Shift-03)

(a) 35 (b) 41
(c) 31 (d) 45

108. If the price of tea is increased by 40%, by how what percentage must the consumption of tea be decreased so as not to increase the expenditure?

SSC CHSL 04/07/2024 (Shift-04)

(a) $31\frac{2}{9}$% (b) $31\frac{3}{5}$%
(c) $35\frac{9}{2}$% (d) $28\frac{4}{7}$%

109. If the price of an article is raised by 35%, by how much percent must a householder reduce his consumption of that article, so as not to increase his expenditure?

SSC CHSL 01/07/2024 (Shift-03)

(a) $25\frac{23}{27}$% (b) $25\frac{22}{27}$%
(c) $25\frac{24}{27}$% (d) $25\frac{25}{27}$%

110. Due to decrease in man power, the production in a factory decreases by 25%. By what per cent should the working hours be increased to restore the original production?

SSC CHSL 10/07/2024 (Shift-03)

(a) $43\frac{6}{7}$% (b) 50%
(c) 25% (d) $33\frac{1}{3}$%

111. The cost of Compressed Natural Gas (CNG) per liter is increased by 65%. By what percentage must Manish reduce his consumption of CNG so as not to increase his expenditure? (correct up to two decimal places)

SSC CPO 28/06/2024 (Shift-03)

(a) 39.39% (b) 30.13%
(c) 45.13% (d) 25.39%

112. If the price of a movie ticket increased by $12\frac{1}{2}$% and the sale of tickets also increased by $8\frac{1}{2}$%, then find % change in income.

SSC CHSL 02/08/2023 Shift-02

(a) 21.875% (b) 22.6750%
(c) 20.675% (d) 22.0625%

113. On reducing the entry fee by 25% in a museum, the number of people coming to the museum increased by 50%, Find the percentage increase or decrease in the collection of the entry fee.

SSC Phase-XI 28/06/2023 (Shift-02)

(a) 10% decrease
(b) 12.5% decrease
(c) 10% increase
(d) 12.5% increase

114. Ramnarayan's salary was reduced by $3\frac{1}{8}$%, and then, the reduced salary was increased by $7\frac{2}{5}$%. By what percentage (rounded off to two decimal places) is his new salary more/less as compared to his original salary?

SSC CPO 28/06/2024 (Shift-02)

(a) 3.03% less (b) 4.04% more
(c) 4.04% less (d) 3.03% more

115. A worker has an increase of $12\frac{1}{2}$% in her wages rate per hour but there is a drop of 10% in the number of hours worked per week. If her original weekly wages for a week of 40 hours is ₹38,400, then the percentage increase in her total weekly wages is:

SSC PHASE-IX 2022

(a) 1.25% (b) 2%
(c) 2.25% (d) 1.15%

116. When the price of an item was reduced by 20%, its sale increased by x%. If there is an increase of 25% in receipt of the revenue, then the value of x is:

SSC CGL Tier II 29/01/2022

(a) 55.35 (b) 57.75
(c) 56.25 (d) 54.35

117. The income of A is 80% of B's income and the expenditure of A is 60% of B's expenditure. If the income of A is equal to 90% of B's expenditure, then by what percentage are the savings of A more than B's savings?

SSC CGL TIER II 29/01/2022

(a) 100% (b) 140%
(c) 125% (d) 150%

118. A's income is equal to 125% of the income of B, while B's savings are 120% of the savings of A. If the expenditure of B is 75% of the expenditure of A, then how much are B's savings as a percentage of her expenditure?

SSC CHSL 08/07/2024 (Shift-02)

(a) 20% (b) $22\frac{1}{2}\%$

(c) $18\frac{3}{4}\%$ (d) $16\frac{2}{3}\%$

• TYPE – VI •
REVERSE CASE

119. The value of a washing machine depreciated from ₹40,960 to ₹21,970 in 3 years. Find the yearly rate of depreciation.

SSC CPO 05/10/2023 (Shift-03)

(a) 18.75% (b) 16.25%

(c) 20% (d) 25%

120. The population of a town increased from 100000 to 250000 in 5 years. What is the approximate compounded percent increase of population per year?

SSC CHSL 13/03/2023 (Shift-03)

(a) 20% (b) 30%

(c) 10% (d) 40%

• TYPE – VII •
SERIES CONCEPT

121. After decreasing 30%, an article costs Rs.3,500. Find its actual cost.

SSC CHSL 09/07/2024 (Shift-04)

(a) Rs.5,000 (b) Rs.4,500

(c) Rs.5,500 (d) Rs.6,500

122. The price of an electric bike was ₹1,25,000 last year. This year, its price got decreased by 30%. What is the price (in ₹) of the electric bike this year?

SSC CHSL 01/07/2024 (Shift-02)

(a) 87,000 (b) 86,000

(c) 87,500 (d) 86,500

123. A car is sold for ₹5,00,000 which is 20% less than its original price. What was the original price of the car?

SSC CHSL 09/07/2024 (Shift-03)

(a) ₹6,25,000 (b) ₹6,50,000

(c) ₹6,75,000 (d) ₹6,00,000

124. If 20% of 35% of a number is 240.8, then 18% of that number (rounded off to 1 decimal place) is:

SSC CHSL 09/07/2024 (Shift-04)

(a) 621.2 (b) 619.2

(c) 623.2 (d) 618.2

125. During the first year the population of a village increased by 5% and during the second year it diminished by 5%. At the end of the second year its population was 47,880. What was the population at the beginning of the first year?

SSC CHSL 02/07/2024 (Shift-01)

(a) 48000 (b) 43500

(c) 53000 (d) 45000

126. Monthly salary of Jitvik in the month of December 2020 was ₹24,800. Every year his salary increases by 5% from the month of January. What was his salary (in ₹) in the month of February 2022?

SSC CHSL 05/07/2024 (Shift-01)

(a) 27342 (b) 27180

(c) 27486 (d) 26485

127. Mohan gets 12% increase in his sale amount in the first year and 15% increase in the second year, with that his present sale is ₹1,28,800. What was his sale two years ago?

SSC CHSL 01/07/2024 (Shift-01)

(a) ₹1,75,000 (b) ₹1,25,000

(c) ₹1,50,000 (d) ₹1,00,000

128. The value of a machine depreciates every year by 5%. If the present value of the machine is ₹80,000, what will beats value after 2 years?

SSC CHSL 08/07/2024 (Shift-04)

(a) ₹72,200 (b) ₹72,000

(c) ₹74,400 (d) ₹74,000

129. The price of a motorcycle was $750 last year. The price increased by 20% this year. What is the price of the motorcycle this year?

SSC CHSL 05/07/2024 (Shift-04)

(a) $600 (b) $750

(c) $900 (d) $790

130. The population of a town increases 8% annually. If its present population is 1,42,560, what was the population one year ago?

SSC CPO 27/06/2024 (Shift-03)

(a) 1,34,000 (b) 1,33,000

(c) 1,32,000 (d) 1,31,000

131. Two years ago, the population of a town was 9487500. Due to migration to big cities, it decreases every year at the rate of 8%. The present population of the town is:

SSC CGL TIER-II (20/01/2025)

(a) 9060110 (b) 7060320

(c) 8070120 (d) 8030220

132. Amit gets 6% increase in his sale amount in the first year and 20% in the second year, with that his present sale is Rs.254400, what was his sale (in Rs.) two years ago?

SSC CGL TIER-II (20/01/2025)

(a) 200000 (b) 180000

(c) 212000 (d) 240000

133. The price of an article is increased by $r^2\%$. The new price was decreased by $r^2\%$ later. Now the latest price is ₹ 1. What was the original price of the article?

SSC CGL 20/07/2023 (Shift-03)

(a) $\frac{10000}{10000-r^2}$ (b) $\frac{10000-r^2}{10000}$

(c) $\frac{100}{100-r^2}$ (d) $\frac{100}{1-r^2}$

134. The population of a city increases every year at the rate of 5%. If the population of the city is 16000, what will be the population after 2 years?

SSC CPO 28/06/2024 (Shift-02)

(a) 17640 (b) 17000

(c) 17700 (d) 17600

135. The population of a village was 4,00,000. It increased by 20% in the first year and increased by 30% in the second year. Its population after two years is _______.

SSC CHSL 11/07/2024 (Shift-01)

(a) 5,40,000 (b) 6,25,000

(c) 6,24,000 (d) 5,20,000

136. The population of the city was 1,75,000 two years ago. If it had increased by 4% and 5% in the last two years, find the present population of the city.

SSC CHSL TIER-II 02/11/2023

(a) 1,92,100 (b) 1,89,200

(c) 1,91,100 (d) 1,93,200

137. A number is first decreased by 28% and then increased by 28%. The number so obtained is 784 less than the original number. Find the value of the original number.

SSC CPO 04/10/2023 (Shift-02)

(a) 15000 (b) 1500

(c) 10000 (d) 1000

138. A district has 10,24,000 inhabitants. If the population increases at the rate of 2.5% per annum, find the number of inhabitants at the end of three years

SSC CGL 02/12/2022 (Shift-02)

(a) 11,20,736 (b) 11,02,736

(c) 10,75,840 (d) 10,64,850

139. The price of an electronic watch is first reduced by 25% and then increased by 50%. If the resulting price of the electronic watch is ₹7,650, then what was its original price (in ₹)?

SSC CHSL 09/07/2024 (Shift-04)

(a) 6,900 (b) 6,800

(c) 6,500 (d) 6,600

140. Suresh studies the pattern of daily sale of a shop. He finds that on Monday, the sale was decreased by 10% in comparison to the sale on Sunday. On Tuesday, the sale was increased by 10% in comparison to the sale of Monday. If the sale on Tuesday was of Rs.1,485, how much was the sale on Sunday?

SSC CHSL 08/07/2024 (Shift-02)

(a) Rs.1,495 (b) Rs.1,485

(c) Rs.1,475 (d) Rs.1,500

141. During the first year, the population of a town increased by 12%.The next year, due to some contagious disease, it decreased by 8%. At the end of the second year, the population was 64,400. Find the population of the town at beginning of the first year.

SSC CGL 05/12/2022 (Shift-04)

(a) 50,00

(b) 54,750

(c) 62,500

(d) 50,500

142. 20% of the inhabitants of a village having died of malaria, a panic set in, during which 30% of the remaining inhabitants left the village. The population was then reduced to12,000. What was the number of inhabitants initially (Consider integral part only)

SSC CGL 07/12/2022 (Shift-02)

(a) 21000 (b) 21428
(c) 21500 (d) 30428

143. On account of corona virus, 5% of the population of a village died. Out of the remaining population, 20% fled due to panic. If the present population is 4655, then what was the population of the village before the corona attack?

SSC CPO 27/06/2024 (Shift-02)

(a) 5995 (b) 6125
(c) 6000 (d) 5985

144. The population of a town is 1,25,000. If the annual birth rate is 12.7% and the annual death rate is 2.7%, how much will the population increase after 3 years?

SSC CPO 09/11/2022 (Shift-03)

(a) 43,285 (b) 41,375
(c) 42,565 (d) 40,275

145. The number of toys manufactured by a machine in 2018 was 25,000, which increased by 20% in 2019. In 2020, the production was hindered by strike and it fell by 15%. How many total toys were manufactured in three years by the machine?

SSC Phase XII 26/06/2024 (Shift-04)

(a) 25500 (b) 80000
(c) 80500 (d) 89500

146. During 2021, the population of a city increased by 8% and in 2022, it increased by 10%. At the end of 2022, its population was 47520. The population of the city at the end of 2021 was:

SSC Phase XII 21/06/2024 (Shift-03)

(a) 40000 (b) 43200
(c) 42300 (d) 44000

147. Two years ago, the population of a small town was 60,000. It increased by 5% in the first year, but due to the pandemic, it decreased by 10% in the second year. What is its present population (after the end 2 years)?

SSC CHSL 02/08/2023 (Shift-04)

(a) 56,700
(b) 56,900
(c) 3300
(d) 55,700

148. The rate of annual growth of a city is 2%. If its population in the year 2020 was 1,50,000, then what would be its population in 2023?

SSC CHSL TIER-II 26/06/2023

(a) 1,59,000
(b) 1,59,181
(c) 1,58,413
(d) 1,58,765

149. In the first year the population of a town decreased by 5% due to the Corona virus first wave. In the next year it decreased again by 5% due to the second wave and in the third year it increased by 5%. At the end of the third year the population was 9,47,625. What was the population at the beginning of the first year?

SSC CGL 08/12/2022 (Shift-03)

(a) 7,00,000 (b) 10,00,000
(c) 8,97,993 (d) 9,92,519

150. The strength of a school increases and decreases every alternate year by 15%. If it started with an increase in 2012, then the strength of the school in the beginning of 2015, as compared to that in 2012, had (correct to two decimal places):

SSC CPO 27/06/2024 (Shift-02)

(a) Decreased by 12.41%
(b) Increased by 12.41%
(c) Decreased by 13.85%
(d) Increased by 13.85%

151. If the number of school going children in a town is 64000 and it is increasing annually by 10%, then what will be the number of school going children in the town at the end of 3 years?

SSC CPO 28/06/2024 (Shift-03)

(a) 85100 (b) 85184
(c) 85000 (d) 80000

152. The strength of a school increases and decreases every alternate year by 20%. It started with an increase in the year 2015 and the initial strength was 3000. Find the strength of the school in the year 2017 and also the percentage of increase in strength, respectively.

SSC MTS 05/09/2023 (Shift-02)

(a) 4556, 17.2% (b) 3556, 16.2%
(c) 3456, 15.2% (d) 4456, 14.2%

153. The population of a place increased to 50,000 from 2016 to 2018 at the rate of 6% per annum, and continued the same trend for the next 3 years. If A is the population in 2016 and B is the population in 2020, both are approximated to the next possible integers, then the value of B – A is:

SSC CGL TIER-II (18/01/2025)

(a) 11680 (b) 16270
(c) 13220 (d) 12850

154. Ramagya spends 22% of his salary on house rent and 75% of the rest on household expenses. If he saves ₹3,705, find his total income (in ₹).

SSC Phase XII 26/06/2024 (Shift-02)

(a) ₹17,000 (b) ₹18,000
(c) ₹21,000 (d) ₹19,000

155. A man spent 60% of his salary on household expenses, 20% of his salary on rent and out of remaining salary, he donated 80% to a trust. If he is left with Rs.20,000, then what is his salary?

SSC CHSL 01/07/2024 (Shift-01)

(a) ₹4,00,000 (b) ₹5,00,000
(c) ₹5,50,000 (d) ₹50,000

156. A person spends 60% of his salary on family expenses, 10% on medical expenses, 5% on charity, and saves the remaining amount. If the amount on savings is ₹4,000, find his monthly salary.

SSC CHSL 05/07/2024 (Shift-04)

(a) ₹16,000 (b) ₹15,000
(c) ₹14,000 (d) ₹12,000

157. Nazeer spends 20% of his monthly income on housing, 25% of the remaining on education, and saves 10% of the remaining. If his monthly salary is ₹52,600, how much money does he save every month?

SSC Phase XII 25/06/2024 (Shift-03)

(a) ₹5,260 (b) ₹1,578
(c) ₹2,367 (d) ₹3,156

158. A man spent 30% of his monthly income on rent. He spent 15% of the remaining amount on food. 35% of the remaining amount was used for all other expenses. If ₹1,62,435 was left with him, then his monthly income was:

SSC CHSL 04/08/2023 (Shift-04)

(a) ₹ 4,80,000 (b) ₹ 4,20,000
(c) ₹ 3,60,000 (d) ₹ 5,40,000

159. A person spends 25% of his income on goods of daily uses. Furthermore, he spends 18% of the rest on house rent and 16% of the rest on travel. After that, only ₹861 is left with him. What is his salary?

SSC CGL 24/07/2023 (Shift-03)

(a) ₹$1852\frac{1}{3}$ (b) ₹$1666\frac{2}{3}$
(c) ₹$1563\frac{1}{3}$ (d) ₹$1426\frac{1}{3}$

160. A father gives 8% of his monthly income to both his sons as pocket money. The elder son gets 85% of the total amount given to both the sons. He spends 90% of the amount and saves ₹17. What is the monthly income of father?

SSC CGL 26/07/2023 (Shift-03)

(a) ₹ 5,000 (b) ₹ 4,500
(c) ₹ 3,500 (d) ₹ 2,500

161. Three years ago, Raman's salary was ₹45000. His salary is increased by 10 percent, A percent and 20 percent in first, second and third year respectively. Raman's present salary is ₹83160. What is the value of A?

SSC CGL TIER-II (08/08/2022)

(a) 50% (b) 40%
(c) 54% (d) 30%

162. 70% of students in a class are girls and 70% of girls have chosen soccer as their favourite sport. If 98 girls have chosen soccer as their favourite sport, what is the total number of students in the class?

SSC CHSL 24/05/2022 (Shift-01)

(a) 180 (b) 225
(c) 175 (d) 200

• TYPE – VIII •
PRICE- CONSUMPTION & EXPENDITURE

163. If the price of a commodity is increased by 36%, by what percentage (rounded off to 1 decimal place) should its consumption be decreased so that the expenditure of the commodity stays the same?

SSC CHSL 11/07/2024 (Shift-04)

(a) 32% (b) 29.5%
(c) 36% (d) 26.5%

164. The cost of tomatoes per kg is increased by 300%. A housewife reduces her consumption of tomatoes by 70%. By what percentage does her expenditure on tomatoes increase or decrease?

SSC CGL 19/09/2024 (Shift-01)

(a) Decreases, 30%
(b) Decreases, 20%
(c) Increases, 30%
(d) Increases, 20%

165. The cost of rice is increased by 25% but its consumption is decreased by 30%. Find the percentage increase or decrease in the expenditure of money.

SSC CHSL 04/07/2024 (Shift-02)

(a) Increase $12\frac{1}{2}\%$
(b) Increase $13\frac{1}{3}\%$
(c) Decrease $12\frac{1}{2}\%$
(d) Decrease $13\frac{1}{3}\%$

166. When the price of a commodity increased by 23%, a family reduced its consumption in such a way that the expenditure on it was only 5% more. By what percentage has the family reduced the consumption of the commodity (correct to one decimal place)?

SSC PHASE-IX 2022

(a) 14.20% (b) 15.8%
(c) 14.6% (d) 15.2%

167. The price of diesel is increased by 26%. A person wants to increase his expenditure by 15% only. By what percentage, correct to one decimal place, should he decrease his consumption?

SSC CPO 25/11/2020 (Shift-01)

(a) 7.2% (b) 6.5%
(c) 8.7% (d) 9.5%

168. The price of a commodity is decreased by 25 percent and therefore a household increased the consumption of that commodity by 20 kg to keep the expenditure same. What was the earlier consumption?

SSC CHSL 13/03/2023 (Shift-01)

(a) 60 kg (b) 55 kg
(c) 75 kg (d) 45 kg

169. If the price of rice is reduced by 24%, it allows Alok to buy 10 kg more rice for ₹2,500. The reduced rate of rice per kg is:

SSC CHSL 08/07/2024 (Shift-01)

(a) ₹25 (b) ₹50
(c) ₹60 (d) ₹75

170. A reduction of 15% in the price of washing powder enables a purchaser to obtain 5 kg more for ₹1,275. The original price of the washing powder per kg is:

SSC Phase-XI 30/06/2023 (Shift-03)

(a) ₹40 (b) ₹35
(c) ₹45 (d) ₹50

171. The reduction of 20% in the price of rice enables a person to obtain 50 kg more for ₹450. Find the original price of rice per kg.

SSC CGL 02/12/2022 (Shift-02)

(a) ₹1 (b) ₹2
(c) ₹1.25 (d) ₹2.25

172. Price of rice is decreased by 25 percent and therefore a person can purchase 30 kg more rice in the same expenditure. If expenditure is ₹5400, then what was the original price of rice per kg?

SSC CGL TIER-II (08/08/2022)

(a) ₹90 per kg (b) ₹75 per kg
(c) ₹50 per kg (d) ₹60 per kg

173. If a reduction of 10% in the price of rice enables a person to obtain 22kg more for ₹250, then the original price of rice per kg is.

SSC Phase-X 04/08/2022 (Shift-02)

(a) ₹1.26 (b) ₹1.24
(c) ₹1.22 (d) ₹1.20

174. The reduction of 15% in the price of salt enables a person to buy 2 kg more for ₹272. The reduced price of salt per kg (in ₹) is:

SSC CGL 11/04/2022 (Shift-03)

(a) 20.40 (b) 22.16
(c) 24.25 (d) 25.00

175. A reduction of 20% in the price of bananas enables a customer to buy 6 more bananas for ₹80. What is the reduced price of bananas per dozen (in ₹)?

SSC CGL 20/04/2022 (Shift-03)

(a) ₹32 (b) ₹36
(c) ₹35 (d) ₹40

176. If due to 12% decrease in the price of sugar, Akshat can buy 7 kg more sugar for ₹ 1,200, then find the actual price (in ₹) of sugar. (Rounded off to 2 decimal places)

SSC MTS 12/09/2023 (Shift-02)

(a) 23.38 (b) 25.79
(c) 26.35 (d) 28.25

• TYPE – IX •
INCOME- EXPENDITURE & SAVINGS

177. If an employee's income is ₹72,000, the amount he spends is 40% higher than his savings. Therefore, his savings (in ₹) is:

SSC CGL 23/09/2024 (Shift-03)

(a) 30000 (b) 34000
(c) 32000 (d) 28000

178. Total savings of X and Y is 40% of their total income. Their average expenditure is ₹21,000. What is the total salary of X and Y?

SSC Phase-XI 28/06/2023 (Shift-04)

(a) ₹55,000 (b) ₹65,000
(c) ₹60,000 (d) ₹70,000

• TYPE – X •
BASED ON ALLIGATION

179. Raman spends 75% of his income. If his income increases by 20% and expenditure also increases by 10%, how much percent will Raman's saving's increase?

SSC CHSL 08/08/2023 (Shift-04)

(a) 35% (b) 40%
(c) 50% (d) 45%

180. The ratio of Richa's expenditure and savings is 2:1. If her income and expenditure is increased by 20% and 15% respectively, find the percentage increase in her savings.

SSC CHSL TIER - II 10/01/2024

(a) 20% (b) 35%
(c) 25% (d) 30%

181. A woman spends $\frac{2}{3}$ of her income. If her income increase by 18% and the expenditure increase by 24%, then the percentage increase in her saving will be:

SSC CGL 11/09/2024 (Shift-03)

(a) 6% (b) 3%
(c) 5% (d) 4%

182. The proportion of Suresh's spending to saving is 3 : 1. His salary rises by 25%. What percentage of his expenditure will increase if his saving grows by 10%?

SSC CGL 12/09/2024 (Shift-03)

(a) 40% (b) 20%
(c) 10% (d) 30%

183. Kalyan spends 80% of his income. His income increases by 15% and his expenditure also increases by 5%. The percentage of increase in his savings is:

SSC CGL 13/09/2024 (Shift-03)

(a) 50% (b) 20%
(c) 55% (d) 40%

184. Rahul spends 70% of his income. His income increased by 15% and his expenditure increased by 7.5%. What is the percentage increase in his savings?

SSC CHSL 04/07/2024 (Shift-02)

(a) 50% (b) 30.5%
(c) 25.5% (d) 32.5%

185. Ramana spends 75% of his income. His income is increased by 25% and he increases his expenditure by 10%. By what percentage are his savings increased?

SSC CHSL 03/07/2024 (Shift-02)

(a) 70% (b) 40%
(c) 60% (d) 50%

186. Raju spends 80% of his income. His income increased by 20%, while his spending rise by 10%. The percentage of increase in his savings is:

SSC CHSL 05/07/2024 (Shift-02)

(a) 30% (b) 48%
(c) 40% (d) 60%

187. Bhavani spends 68% of her income. Her income increases by 15% and her expenditure increases by 10%. How much is the increase in the percentage of saving? (Use decimal up to 2 digits)

SSC CPO 28/06/2024 (Shift-01)

(a) 20.57% (b) 25.62%
(c) 28.42% (d) 24.80%

188. Ramesh spends 60% of his income. If his income is increased by 30% and his expenditure is increased by 20%, then the percentage increase in the savings of Ramesh will be:

SSC Phase XII 20/06/2024 (Shift-03)

(a) 35% (b) 30%
(c) 45% (d) 50%

189. Anita saves 20% of her income. If her income is increased by 30% and she saves 25% of the new income, by what percentage will her actual savings increase?

SSC Phase XII 20/06/2024 (Shift-02)

(a) 83% (b) 62.50%
(c) 65.20% (d) 70%

190. Suresh could save 20% of his income. But 4 years later, when his income increased by 40%, he could save the same amount only as before. By how much percentage did his expenditure increase?

SSC MTS 14/09/2023 (Shift-02)

(a) 22% (b) 23%
(c) 50% (d) 45%

191. Ajay spends $66\frac{2}{3}\%$ of his income on different household items. If his income increases by 25% and expenditure increase by 20%, then the effect on his savings will be:

SSC CGL 17/09/2024 (Shift-03)

(a) 28% (b) 61%
(c) 49% (d) 35%

192. The income of a person is ₹16,500, and his expenditure is ₹12,000. Next year, his income increases by 24% but his expenditure decreases by 10%. The percentage increase (rounded off to the nearest integer) in his savings is:

SSC CGL 24/09/2024 (Shift-03)

(a) 90% (b) 120%
(c) 115% (d) 95%

193. The ratio of expenditure to savings of a woman is 4 : 1. If her income and expenditure are increased by 20% and 10%, respectively, then find the percentage change in her savings.

SSC CGL 25/09/2024 (Shift-02)

(a) 40% (b) 50%
(c) 60% (d) 30%

194. The monthly income of Ramesh in year 2021 was ₹18,600 and his monthly expenditure was ₹12,400. In year 2022 his income increased by 15% and his expenditure increased by 8%. Find the percentage increase in his savings.

SSC CGL 25/09/2024 (Shift-03)

(a) 29% (b) 32%
(c) 25% (d) 27%

195. Suresh's expenditure and savings are in the ratio of 3 : 1. His income increases by 25%. If his savings increase by 20%, then by how much percentage does his expenditure increase?

SSC CGL 26/09/2024 (Shift-02)

(a) $27\frac{2}{3}\%$ (b) $25\frac{2}{3}\%$
(c) $28\frac{2}{3}\%$ (d) $26\frac{2}{3}\%$

196. The monthly expenditure of a person is 40% more than his monthly savings. If his monthly income increases by 40% and monthly expenditure increases by 60%, then he saves ₹2,070 more in a month. What is his initial monthly expenditure (in ₹)?

SSC PHASE-IX 2022

(a) 20,250 (b) 19,320
(c) 24,150 (d) 22,425

197. Ramesh saves $26\frac{2}{3}\%$ of his monthly salary. When his expenses are increased by 20%, he is able to save ₹4,080 per month. His monthly salary is:

SSC CHSL 09/08/2021 (Shift-02)

(a) ₹30,000 (b) ₹34,000
(c) ₹35,000 (d) ₹38,000

198. Ramu used to spend 72% of his income. His income has increased by 12%, and he increases his expenditure by 5%. If Ramu earlier saved y and after the increases he now saves x, then what is the value of $\left(\frac{x-y}{y}\times100\right)\%$?

SSC CHSL 04/07/2024 (Shift-04)

(a) 25% (b) 22%
(c) 27% (d) 30%

199. A person saves 45% of his income. Next year, his income increases by 200%. He increases his savings by five times the previous year's savings. By what percentage (correct to one place of decimal) has he increased/decreased his expenditure?

SSC CHSL 09/07/2024 (Shift-01)

(a) Decreased, 63.4%
(b) Decreased, 36.4%
(c) Increased, 63.4%
(d) Increased, 36.4%

200. Rumi used to save 20% of her income. If her income went up by 30%,while her expenditure went up by 40%, her nominal saving went down by ₹750.Find Rumi's initial income(in ₹).

SSC CHSL 07/08/2023 (Shift-02)

(a) 36,000 (b) 37,500
(c) 35,000 (d) 38,500

201. A person earns ₹16,000 per month and spends 80% of his income and saves the remaining amount. If his income increases by 20% and expenditure by 10%, find the percentage of increase in his savings.

SSC CGL 09/09/2024 (Shift-02)

(a) 140% (b) 90%
(c) 120% (d) 60%

202. The ratio between the monthly income and the expenditure of Vedic is 8 : 5. If his income increases by 20% and his expenditure increases by 30%, Then find the percentage increase or decrease in his monthly savings.

SSC CGL 14/07/2023 (Shift-04)

(a) $5\frac{2}{3}\%$ increase
(b) $5\frac{2}{3}\%$ decrease
(c) $3\frac{1}{3}\%$ increase
(d) $3\frac{1}{3}\%$ decrease

203. The monthly income of a person was ₹12000 and his monthly expenditure was ₹8000. Next year, his income increased by 10% and his expenditure by 8%. Find the percentage increase in his savings.

SSC CGL 21/07/2023 (Shift-01)

(a) 10% (b) 14%
(c) 12% (d) 15%

204. A saves 18% of his income. If his income increases by 41% and still saves the same amount. Find the percentage increases in his expenditure

SSC MTS 02/05/2023 (Shift-01)

(a) 60% (b) 35%
(c) 50% (d) 40%

205. Mr. X has a monthly income of \$26,500 and his monthly expenditure is \$20,500. The next year, his salary is increased by 12% and expenditure is increased by 6%. His savings increase by how much percent?

SSC CGL 05/12/2022 (Shift-03)

(a) 32.5% (b) 27.3%
(c) 32.0% (d) 34.7%

206. A spends 65%, of his income. His income is increased by 20.1% and the expenditure is increased by 20%. By what percent (correct to one decimal place) does his saving increase or decrease?

SSC CGL 13/04/2022 (Shift-02)

(a) Decrease by 18.9%
(b) Increase by 20.3%
(c) Decrease by 17.7%
(d) Increase by 21.5%

207. Radha saves x% of her income. If her income increases by 28% and the expenditure increases by 20%, then her savings increases by 40%. What is the value of x?

SSC CGL 23/08/2021 (Shift-01)

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(a) 35 (b) 40
(c) 50 (d) 25

208. The income of Raju is 25% more than that of Manju. Raju got a 25% rise in his income, and Manju got a 40% rise is his income, the percentage increase in their combined income is:

SSC CPO 11/11/2022 (Shift-01)

(a) 51.72% (b) 31.67%
(c) 22.43% (d) 41.26%

209. The ratio of the number of boys and girls in a school is 3 : 4 respectively. If the number of boys is increased by 10% and the number of girls is increased by 15%, then what will be the new ratio of the number of boys to the number of girls?

SSC CPO 09/11/2022 (Shift-01)

(a) $\frac{33}{45}$ (b) $\frac{35}{46}$
(c) $\frac{33}{46}$ (d) $\frac{46}{33}$

210. In a class, the ratio of the number of boys to that of the girls is 11:9. 30% of the boys and 20% of the girls passed an exam. Find the percentage of students who passed the exam.

SSC CHSL 26/05/2022 (Shift-02)

(a) 3.92% (b) 20%
(c) 24.5% (d) 25.5%

211. In an institute, 35% are boys and the rest are girls. If 30% of the boys failed and 60% of the girls passed in an examination, then the percentage of the students who failed in the examination is:

SSC PHASE-IX 2022

(a) 35.5% (b) 36.5%
(c) 35% (d) 40%

212. In an examination, 45% of all the students who appeared are boys and the rest are girls. If 60% of the boys and 70% of the girls passed, then what is the percentage of students who failed?

SSC CGL 18/08/2021 (Shift-01)

(a) 36 (b) 35.4
(c) 40 (d) 34.5

213. In a class, 60% of the students are girls and the rest are boys. 45% of the girls pass an examination and 40% of the boys failed. If the number of girls who failed is 66, the number of boys who passed the examination is:

SSC CHSL 15/04/2021 (Shift-01)

(a) 36 (b) 48
(c) 54 (d) 60

214. The average pass percentage of girls in class X examination in a school is 85% and that of boys is 83%. The average pass percentage of all boys and girls in class X of that school is 83.7%. Find the percentage of the number of girls in class X of that school.

SSC CHSL 09/08/2021 (Shift-02)

(a) 45% (b) 40%
(c) 30% (d) 35%

215. In a class, out of the total number of students, $83\frac{1}{3}\%$ are girls and the remaining are boys. If 60% boys and 80% girls are present, then what percentage of total students of the class are absent?

SSC CGL Tier-II 12/09/2019

(a) $26\frac{2}{3}$ (b) $22\frac{2}{3}$
(c) $23\frac{1}{3}$ (d) $12\frac{1}{3}$

216. In January 2022, Kriti paid an EMI, which was 22% of her monthly salary. She spent the remaining salary on shopping of groceries and clothes in the ratio 7: 5. She spent ₹18,200 on shopping of clothes. If in February 2022, her salary increased by 16%, then what was her salary (in ₹) in February?

SSC CGL 24/07/2023 (Shift-01)

(a) 66,350 (b) 68,520
(c) 70,250 (d) 64,960

217. Suhani pays tax at the rate of 30% on her entire income of ₹ 90,000 and Ritika pays tax at the rate of 40% on her entire income of ₹y. If the overall tax rate on their combined income comes to 37%, then what is the value of y?

SSC CGL 17/07/2023 (Shift-02)

(a) ₹2,04,000 (b) ₹2,16,000
(c) ₹2,13,000 (d) ₹2,10,000

◆ TYPE – XI ◆
BASED ON PASSING/FAILURE IN AN EXAM

218. Pass percentage of an examination is 35%. If a student who got 210 marks, failed by 14 marks, then what are the maximum marks of the examination?

SSC Phase XII 25/06/2024 (Shift-02)

(a) 660 (b) 600
(c) 640 (d) 620

219. John got 20% marks in an examination and failed by 10 marks. In the same examination, Jack got 35% marks which were 20 more than the minimum passing marks. Find the percentage of minimum marks required to pass.

SSC CGL 21/07/2023 (Shift-03)

(a) 30% (b) 35%
(c) 25% (d) 20%

220. In an examination a student who got 20% marks, failed by 30 marks. But another student who got 32% marks got 42 marks more than the required marks to pass. Find the maximum number of marks.

SSC CHSL 04/08/2023 (Shift-03)

(a) 600 (b) 700
(c) 500 (d) 400

221. Rajiv scored 20 percent marks in an exam and failed by 25 marks. If he scores 50 percent marks, then he gets 20 marks more than passing marks. What is the passing marks for the exam?

SSC CHSL 14/03/2023 (Shift-01)

(a) 40 (b) 35
(c) 55 (d) 45

222. R targets to score 85% marks in exams. He scores 450 marks and miss the target by 35%. How much increment in percentage should be there in his scored marks to meet the target?

SSC CGL 23/09/2024 (Shift-01)

(a) 70 (b) 35
(c) 53 (d) 45

◆ TYPE – XII ◆
BASED ON ELECTION

223. Three persons ran for office and got, 1136, 7636 & 11628 votes, respectively. What was the winning candidate's percentage of the total votes?

SSC CHSL 01/07/2024 (Shift-02)

(a) 57% (b) 59%
(c) 52% (d) 61%

224. The difference between 31% and 26% of votes for the same party at different places is 2350. What is 7% of those votes?

SSC CHSL 05/07/2024 (Shift-01)

(a) 2270 (b) 3090
(c) 4090 (d) 3290

225. Two candidates contested an election. One of them got 64% of the votes and won by 434 votes. What was the total number of votes polled?

SSC CGL Tier II 03/03/2023

(a) 1550 (b) 1345
(c) 1680 (d) 1684

226. In an election between two candidates, the one who gets 88% of the votes is elected by a majority of 684 votes. What is the total number of votes polled? (all polled votes are valid)

SSC CGL 18/09/2024 (Shift-02)

(a) 900 (b) 800
(c) 850 (d) 750

227. In an election, a candidate secured 41% of the votes polled and lost the election by 97,632. What is the number of votes obtained by the winning candidate ?

SSC CHSL 01/07/2024 (Shift-05)

(a) 320016 (b) 542400
(c) 222384 (d) 360072

228. In an election between two candidates A and B, A got 33% of total votes casted and still lost by 55,522 votes. Find the total number of votes got by B.

SSC CHSL 01/07/2024 (Shift-03)

(a) 1,09,114 (b) 1,09,141
(c) 1,04,911 (d) 1,09,411

229. In an election between two candidates, one candidate gets 72% of the total votes cast. If the total votes are 1000,by how many votes does the winner win the election?

SSC CHSL 05/07/2024 (Shift-02)

(a) 360 (b) 250
(c) 720 (d) 440

230. In an election between two candidates, a candidate who gets 78% of the votes is elected by a majority of 448 votes. What is the total number of votes polled?

SSC CHSL 03/07/2024 (Shift-01)

(a) 800 (b) 750
(c) 850 (d) 700

231. In an election contested by two candidates, one candidate got 42% of the total votes and still lost by 800 votes. Find the total number of votes that were cast.

SSC CHSL 08/07/2024 (Shift-04)

(a) 2000 (b) 5000
(c) 8000 (d) 7000

232. In an election there were only two candidates. One of the candidates secured 35% of votes and is defeated by the other candidate by 381 votes. The total number of votes polled is:

SSC CHSL 09/07/2024 (Shift-03)

(a) 1270 (b) 1028
(c) 635 (d) 514

233. In an election, a candidate secures 40% of the votes, but is defeated by the only other candidate with a majority of 298 votes. Find the total number of votes recorded.

SSC CHSL 10/07/2024 (Shift-03)

(a) 1,470 (b) 1,490
(c) 1,270 (d) 1,290

234. In an election, there were only two candidates. One of the candidates secured 44% of the votes and is defeated by the other candidate by 1440 votes. If there were no invalid votes. then the total number of votes polled is:

SSC CHSL 11/07/2024 (Shift-02)

(a) 14000 (b) 12000
(c) 15000 (d) 13000

235. In an election a candidate secured 47% of the votes and lost to his only opponent by 276 votes. Find the total number of votes polled.

SSC CHSL 08/07/2024 (Shift-03)

(a) 4000 (b) 4200
(c) 3800 (d) 4600

236. In an election there were three candidates. The first candidate got 40% votes and second candidate got 35%votes. If the total votes in the election are 50,000, find the number of votes got by the third candidate.

SSC CHSL 10/07/2024 (Shift-02)

(a) 13,500 (b) 12,500
(c) 12,000 (d) 1,250

237. In an election between two candidates, the candidate who gets 35% of the votes polled is defeated by 15,900 votes. What is the total number of votes polled?

SSC CPO 28/06/2024 (Shift-01)

(a) 53,000
(b) 45,000
(c) 35,000
(d) 43,000

238. Vinod and Sanjay were fighting against each other for the post of a village Pradhan. Sanjay got 47.5% votes and lost the election by 270 votes. How many votes did Vinod get (assuming that all the villagers participated in the voting)?

SSC Phase XII 26/06/2024 (Shift-03)

(a) 2385 (b) 2835
(c) 2565 (d) 2655

239. In an election, the candidate who gets 90% votes is elected by a margin of 800 votes. What is the total number of votes cast?

Note: Only two candidates are participating in the election and assume all votes are valid.

SSC CHSL TIER-II 10/01/2024

(a) 900 (b) 1000
(c) 1050 (d) 950

240. In an election between R and S, R gets 110% of the votes of S and beats S by 770 votes. If there were no invalid votes, then the total number of votes polled is:

SSC CGL 13/09/2024 (Shift-01)

(a) 17610 (b) 17160
(c) 16170 (d) 16710

241. A total of 7,50,000 voter participated in an election. A candidate received 3,82,500 votes which was 60% of the total valid votes. What was the percentage of invalid votes in the election?

SSC CHSL 04/08/2023 (Shift-01)

(a) 15% (b) 20%
(c) 12% (d) 18%

242. In an election, 95% of the total voter cast their votes. In this election, there were only two candidates A and B. The winner A, by obtaining 75% of the total votes, defeated his contestant B by 5500 votes. Find the total number of voter in the election.

SSC CPO 29/06/2024 (Shift-03)

(a) 11,000 (b) 10,000
(c) 13,000 (d) 12,000

243. In an election, A received 27% of the votes and B received 125,982 votes. 19% did not cast their votes. Find the number of votes received by A.

SSC CPO 27/06/2024 (Shift-03)

(a) 44,327 (b) 1,88,973
(c) 57,827 (d) 62,991

244. In an election between two candidates, one got 60% of the total valid votes, 90% of the votes were valid. If the total number of votes was 12000, then what was the number of valid votes that the other candidate got?

SSC CHSL 13/03/2023 (Shift-04)

(a) 8840 (b) 4320
(c) 10800 (d) 6200

245. In an election between two candidates, 15% of the votes were invalid and one candidate got 52% of the total valid votes. If the total number of votes was 8000, what was the number of valid votes that the other candidate got?

SSC CHSL 10/07/2024 (Shift-04)

(a) 3840 (b) 3536
(c) 6800 (d) 3264

246. In an election between two candidates, 10% of the registered voters did not cast their vote. The winning candidate got 60% of the total votes cast and defeated the other candidate by 1242 votes. Find the total number of registered voters.

SSC CHSL 03/07/2024 (Shift-03)

(a) 8640 (b) 9600
(c) 6200 (d) 6900

247. In an election between two candidates, one got 65% of the total valid votes. 20% of the votes were invalid. If the total number of votes was 7,500, the number of valid votes that the other candidate got was:

SSC CHSL 02/07/2024 (Shift-04)

(a) 4,300 (b) 1,700
(c) 1,900 (d) 2,100

248. In an election between two candidates, Anant and Arvind, Anant got 55% of the total valid votes, and 20% of the votes were invalid. If the total number of votes was 30,000, find the number of valid votes that Arvind got.

SSC CHSL 10/07/2024 (Shift-04)

(a) 10800 (b) 1080
(c) 13200 (d) 24000

249. In an election between two candidates, one got 60% of the total valid votes and 15% of the votes were invalid. If the total number of votes were 8400, the number of valid votes that the other candidate got were:

SSC CHSL 03/07/2024 (Shift-04)

(a) 2998 (b) 2856
(c) 3213 (d) 3117

250. In an election between two candidates, one got 60% of the total valid votes. 25% of the votes were invalid. If the total number of votes was 15,000, then find the number of valid votes that the other candidate got.

SSC CPO 27/06/2024 (Shift-01)

(a) 5,550 (b) 4,500
(c) 6,750 (d) 5,000

251. In an election, there were only two candidates. 12% of the voter did not cast their votes. The winner by obtaining 60% of the total votes defeated his opposite contestant by 1200 votes. Find the total number of votes.

SSC Phase XII 20/06/2024 (Shift-03)

(a) 3750 (b) 3570
(c) 4000 (d) 5730

252. In an election between two candidates, the first gets 75% of the total valid votes. If 20% votes are invalid among 2,48,000 votes, then how many votes were cast in the favour of the other candidate?

SSC Phase XII 20/06/2024 (Shift-02)

(a) 56600 (b) 46800
(c) 53800 (d) 49600

253. In an election between two candidates, 75% of the voter cast their votes, out of which 4% of the votes were declared invalid. A candidate got 9504 votes, which were 80% of the valid votes. Find the total number of votes enrolled in that election.

SSC Phase XII 20/06/2024 (Shift-04)

(a) 12,375 (b) 12,672
(c) 13,200 (d) 16,500

254. Two candidates A and B contested in an election. 80% of the voter cast their votes, out of which 2% of the votes were invalid. A got 9,408 votes which was 60% of the valid votes. Find the total number of votes.

SSC CHSL 10/08/2023 (Shift-04)

(a) 12,000 (b) 22,000
(c) 20,000 (d) 21,000

255. In a constituency, 90% of the total number of people on the electoral roll cast their votes during an election. 15% of the votes cast were declared invalid. Jeeta secured 60% of the valid votes. If Jeeta secured 91,800 valid votes, what was the total number of people on the electoral roll?

SSC CGL 17/07/2023 (Shift-03)

(a) 2,16,000 (b) 2,25,000
(c) 1,80,000 (d) 2,00,000

256. In a constituency, 85% of the total number of people on the electoral roll cast their votes during an election. 10% of the votes cast were declared invalid. If there were 3,00,000 people on the electoral roll, and Dharam secured 1,37,700 valid votes, then what percentage of the total number of valid votes did Dharam secure?

SSC CGL 18/07/2023 (Shift-03)

(a) 50.5% (b) 70.2%
(c) 45.9% (d) 60%

257. In an election between two candidates, one candidate got 60% of the valid votes. If the total number of votes polled were 8850, and 10% of the votes were invalid, then find the number of valid votes that the other candidate got.

SSC Phase-XI 28/06/2023 (Shift-01)

(a) 3816 (b) 3186
(c) 3681 (d) 3618

258. In the election, 8% of the voter did not cast their votes. Two candidates contested the election in which the winning candidate got 48% of the total votes and won election by 1100 votes. Find the total number of voter in the election, given that all the votes cast were valid?

SSC CGL 02/12/2022 (Shift-01)

(a) 25500 (b) 26500
(c) 27500 (d) 28500

259. In an election between two candidates, 12% of voter did not cast their votes. The winner by obtaining 68% of the total votes defeated his contestant by 2880 votes. What was the total number of voter who cast their votes in the election?

SSC CGL 02/12/2022 (Shift-03)

(a) 5280 (b) 8000
(c) 4000 (d) 6000

260. In an election between two candidates, 65% of the voter cast their votes, out of which 3% of the votes were decided to be invalid. A candidate got 81965 votes which are 65% of the total valid votes. What is the total number of votes enrolled in that election?

SSC CPO 09/11/2022 (Shift-03)

(a) 200000 (b) 190000
(c) 215000 (d) 185000

261. In a two-candidate election, 10% of the voter did not cast their ballots, 10% of the votes casted were found invalid. The winning candidate received 54% of the valid votes and a 1620-vote majority. Find the number of people on the voter list who have registered to vote.

SSC CPO 09/11/2022 (Shift-03)

(a) 25000 (b) 26000
(c) 24500 (d) 25500

262. In an assembly election, a candidate got 60% of the total valid votes. 2% of the total votes were declared invalid. If the total number of voter is 1,50,000, then find the number of valid votes polled in favor of that candidate.

SSC CPO 11/11/2022 (Shift-02)

(a) 90,000 (b) 78,000
(c) 86,400 (d) 88,200

263. In an election between two candidates, 85% of the voter cast their votes, out of which 4% of the votes were declared invalid. A candidate got 6936 votes which were 85% of the valid votes. Find the total number of voter enrolled in that election.

SSC CPO 11/11/2022 (Shift-03)

(a) 10,500 (b) 10,800
(c) 10,000 (d) 10,700

264. In an election between Sunita and Mamata, 85% of voters cast their votes but 2% of votes were invalid. If Sunita got 64,974 votes which is 78% of valid votes, then the total number of voters enrolled in the election was:

SSC CGL 10/09/2024 (Shift-03)

(a) 1,25,000 (b) 1,00,000
(c) 1,65,000 (d) 1,80,000

265. Two candidates contested in an election. 80% of the voters cast their votes, out of which 5% of the polled votes were invalid. The winning candidate got 70% of valid votes and won by a majority of 36,480 votes. Find the total number of voters.

SSC CGL 17/09/2024 (Shift-02)

(a) 1,15,000 (b) 1,20,000
(c) 1,25,000 (d) 1,18,000

266. In an election between two candidates, P received 42% of the valid votes and Q won by 45,360 votes. 20% people did not cast their vote. If 10% of the votes cast were found invalid, what is the total number of votes registered in the poll booth?

SSC CGL 23/09/2024 (Shift-02)

(a) 3,93,750 (b) 3,59,000
(c) 3,93,600 (d) 3,53,790

267. In an election between two candidates, 80% of the voters cast their votes, out of which 4% votes were declared invalid. A candidate got 15,360 votes which were 80% of the valid votes. Find the total number of votes.

SSC CGL 24/09/2024 (Shift-01)

(a) 20000 (b) 18000
(c) 25000 (d) 23000

268. In an election between two candidates, 10% of the voters did not cast their votes and 5% of the votes polled were found invalid. The successful candidate got 52.5% of the valid votes and won by a majority of 1710 votes. The number of voters enrolled on the voters list was:

SSC CHSL 09/07/2024 (Shift-01)

(a) 36000 (b) 40000
(c) 42000 (d) 48000

269. In an election between two candidates, A gets 63% of the total valid votes. If the total votes polled were 8,750,what is the number of valid votes that the other candidate B gets, if 20% of the total votes were declared invalid?

SSC CHSL 10/07/2024 (Shift-01)

(a) 4,410 (b) 2,590
(c) 3,560 (d) 6,450

270. In an assembly election, a candidate got 60% of the total valid votes. 3% of the total votes were declared invalid. If the total number of voters is 2,40,000, then find the number of valid votes polled in favour of the candidate

SSC CHSL 05/07/2024 (Shift-03)

(a) 193680 (b) 139680
(c) 139860 (d) 139608

271. In an election between two candidates 30% of the electorate did not cast their votes. 20% of the votes polled were found invalid. The winning candidate got 64% of the valid votes and won by a majority of 3136 votes. Find the number of voter enrolled in the voter list.

SSC CPO 03/10/2023 (Shift-03)

(a) 24000 (b) 20000
(c) 25000 (d) 30000

272. In an election between two candidates, 80% of the voter cast their votes, out of which 5% votes were declared invalid. A candidate got 9500 votes which were 80% of the valid votes. Find the total number of voter enrolled in that election.

SSC CPO 04/10/2023 (Shift-01)

(a) 14780 (b) 15625
(c) 16100 (d) 15100

273. In a village election between three candidates, 80% of the votes cast their votes, out of which 3% votes were declared invalid. The winning candidate got 42,680 votes which were 55% of the total valid votes. Find the number of valid votes received by the candidate who stood third, given that he received only 10% of the total valid votes.

SSC CHSL 03/08/2023 (Shift-01)

(a) 7760 (b) 7700
(c) 7670 (d) 7680

274. In an election between two candidates, 10% of the voter in the voter list did not cast their vote, whereas 10% of the votes cast were found to be invalid. The winning candidate got 56% of the valid votes and won the election by a margin of 1,458 votes. What is the total number of voter enrolled in the voter list?

SSC CGL 24/07/2023 (Shift-02)

(a) 14,000 (b) 15,000

(c) 16,000 (d) 13,000

275. In an election between two candidates, 20% of the registered voter did not cast their votes and 40 votes were declared invalid. The winner received 42% of the registered votes and was declared the winner by 112 votes. What was the number of registered voter?

SSC CHSL TIER-II 26/06/2023

(a) 1200 (b) 1500

(c) 1800 (d) 3800

276. In an election between two candidates, y% of the voters did not vote. 10% of the votes cast were declared invalid, while all the valid votes were cast in favour of either of the two candidates. The candidate who got 59.375% of the valid votes cast was declared elected by 2484 votes. If the number of people eligible to vote in that election was 16,000, what is the value of y?

SSC CGL 09/09/2024 (Shift-01)

(a) 7.2 (b) 8.4

(c) 8 (d) 7.5

277. In an election, 2% persons enrolled in the voter list did not participate and 500 votes were invalid. Two candidates A and B fought the election and A defeated B by 200 votes. If 43% of the persons enrolled in the voter list casted their votes in favour of A, then what is the number of the total casted votes?

SSC CGL 14/07/2023 (Shift-02)

(a) 2450 (b) 2800

(c) 3000 (d) 3250

278. In an election between two candidates P and Q, P got 78% of the total valid votes. If the total votes of the electorate were 75,60,000, then what was the number of valid votes that Q got if 10% of the voters did not cast their vote and 15% of the votes polled were declared invalid?

SSC CGL 11/09/2024 (Shift-01)

(a) 1,41,372 (b) 1,41,732

(c) 12,72,348 (d) 1,47,312

279. In a Panchayat election, three contestants - A, B, and C - are contesting. 75% of the total population of 8000 cast their votes. There were no invalid or NOTA votes in the election. A got the least votes, with only 300 votes. B got 66% of the total votes and won the election. How many votes did B get?

SSC Phase XII 20/06/2024 (Shift-01)

(a) 3960 (b) 5280

(c) 3660 (d) 4060

280. Raju, Ravi and Ashok contested an election. 5% votes polled were invalid. Raju got 30% of the total votes. Ravi got 32% of the total votes. The winner got 5136 more votes than the person who received the least number of votes. Find the total number of votes polled.

SSC CGL 01/12/2022 (Shift-04)

(a) 171200 (b) 64200

(c) 171220 (d) 172100

281. In an election, there were three candidates: A, B and C. 10% of the eligible voter did not vote. Out of those who voted, 45% voted for A, 35% voted for B and the remaining 20% voted for C. 30% of the votes polled for A and 20% of the votes polled for B were later deemed invalid, while all the votes polled for C were deemed valid. If A got 882 more valid votes than B did, how many valid votes did C receive?

SSC CHSL 27/05/2022 (Shift-02)

(a) 5020 (b) 5040

(c) 5050 (d) 5060

282. Chamanlal, Arshad and Jagjit Singh contested an election. All the votes polled were valid. Arshad got 35% of the total votes. For every 35 votes Chamanlal got 14 votes. The winner got 4950 more votes than the person who received the least number of votes. Find the total number of votes polled.

SSC CGL 16/08/2021 (Shift-02)

(a) 13378 (b) 38000

(c) 99000 (d) 33000

283. Three candidates X, Y and Z participated in an election. X got 30% more votes than Y, whereas Z got 25% more votes than Y. X also overtook Z by 5000 votes. If 71% of the voters voted and no invalid votes were cast, then what was the total number of voters in the voting list?

SSC CGL 19/09/2024 (Shift-03)

(a) 5,00,000 (b) 4,05,000

(c) 3,55,000 (d) 4,50,000

284. In an election between two candidates, 30% voters did not cast their votes and 200 votes were declared invalid. The winner got 65% of the valid votes. If he won by 1200 votes, then find the total votes.

SSC CHSL 11/07/2024 (Shift-02)

(a) 9000 (b) 6000

(c) 7000 (d) 8000

285. At an election involving two candidates, 68 votes are declared invalid. The winning candidate get 52% of the valid votes and wins by 98 votes. The total number of votes polled is:

SSC CHSL 08/07/2024 (Shift-03)

(a) 2475 (b) 2518

(c) 2500 (d) 2250

286. An election was held between two candidates. The winning candidate scored 54% of the valid votes and won by 88 votes. If 58 votes were declared invalid, then find the total number of votes polled in the election.

SSC CHSL 11/07/2024 (Shift-04)

(a) 1850 (b) 1158

(c) 1156 (d) 2000

287. In an election between two candidates, the defeated candidate secured 42% of the valid votes polled and lost the election by 2545800 votes. If 365500 votes were declared invalid and 30% people did not cast their vote, what was the approximate number of people (in millions) in the electorate who did NOT cast their votes?

SSC CHSL 03/07/2024 (Shift-01)

(a) 5 (b) 6

(c) 8 (d) 7

288. In an election, the winner was supported by 46% of all the voter in the list, and he got 410 votes more than his only rival. 10% of the voter on the voters list did not cast their votes, and 60 voter cast their ballot papers blank. How many voter were on the list?

SSC CPO 27/06/2024 (Shift-02)

(a) 17445 (b) 16550

(c) 17500 (d) 15750

289. In an election, 12% of the voter in the voter list did not cast their votes, whereas 84 voter cast their ballot papers blank. There were only two candidates: Ramagya and Shravan. The winner, Ramagya, was supported by 54% of all the voter in the list. He got 1456 more votes than his rival, Shravan. Find the total number of voter in the list.

SSC CPO 27/06/2024 (Shift-01)

(a) 5690 (b) 6670

(c) 7860 (d) 6860

290. In an election between two candidates, 10% of the voter did not cast their votes and 75 votes were found invalid. The winner got 50% of the total votes expected and won by 170 votes. How many voter were enrolled in the voters list?

SSC CPO 27/06/2024 (Shift-03)

(a) 800 (b) 855

(c) 850 (d) 950

291. In an election between two candidates, 20% of the voter on the voter list did not cast their votes and 80 voter cast their ballot papers blank. The winner secured 45% of all the voter in the list and he got 280 votes more than his rival. The number of voter on the list was:

SSC CPO 05/10/2023 (Shift-01)

(a) 2000 (b) 2800

(c) 2500 (d) 1500

292. In an election between A and B, every fifth vote polled was marked as invalid by the machine. In the remaining votes, A wins the election with a margin of 2500 votes or 10% of the total votes polled, over B. If 90% of the invalid votes would have been in favour of B, then which of the following would have been the result of the election?

SSC CPO 28/06/2024 (Shift-02)

(a) B would have won by 8%

(b) B would have won by 3%

(c) A would have won by 3%

(d) A would have won by 8%

293. In an election between two candidates, 64% of the voter cast their votes, out of which 4% of the votes were declared invalid. A candidate got 12,288 votes which were 64% of the total valid votes. Find the total number of votes enrolled in that election.

SSC CHSL TIER-II 02/11/2023

(a) 31,250
(b) 30,250
(c) 32,152
(d) 20,152

294. In an election, 15% of the voter on the voter list did not cast their votes and 100 voter cast their ballot paper blank. There were only two candidates Ram and Shyam. The winner, Ram, was supported by 69% of all the voter in the list and he got 630 votes more than Shyam. Find the number of voter on the list.

SSC Phase-XI 30/06/2023 (Shift-03)

(a) 1200
(b) 1000
(c) 1100
(d) 1300

295. In an election between two candidates, the defeated candidate secured 42% of the valid votes polled and lost the election by 7,68,400 votes. If 82,560 votes were declared invalid and 20% people did NOT cast their vote, then the invalid votes were what percentage (rounded off to 1 decimal place) of the votes which people did NOT cast?

SSC CGL 02/12/2022 (Shift-02)

(a) 10.6%
(b) 9.8%
(c) 12.9%
(d) 6.7%

296. In an election contested between two candidates, 15% of the total voter did not cast their votes and 100 votes got disqualified. The candidate who won the election won it by securing 45% of the total votes and won by a margin of 400 votes. Find the total number of voter?

SSC CGL 09/12/2022 (Shift-02)

(a) 6,000
(b) 3,600
(c) 10,000
(d) 3,500

297. Rajat, Pooja and Abha participate in the election. If the total votes polled are 40,000 and 10% of votes are invalid. Rajat got 36% of valid votes and Pooja got 40% of valid votes, then find the number of votes Abha got.

SSC CHSL 14/08/2023 (Shift-01)

(a) 9245
(b) 1024
(c) 8640
(d) 5760

298. In a state election between two parties, 83% of the voters cast their votes, out of which 4% of the votes were declared invalid. Party A got 156611 votes which were 83% of the total valid votes. Find the total number of votes enrolled in that election. (Consider integer part only)

SSC CHSL 04/07/2024 (Shift-01)

(a) 2,58,233
(b) 2,34,888
(c) 2,36,807
(d) 23,46,807

299. In an election between P, R and S, $\frac{1}{10}$ of the total votes polled are invalid. Votes polled in favour of R and S are half of the total votes polled, and they get equal votes. Due to a fault in the machine, half of the votes of S and half of the invalid votes are counted additionally in favour of R. What is the overall percentage of votes secured by R due to the fault?

SSC CPO 28/06/2024 (Shift-03)

(a) 37.55%
(b) 41.55%
(c) 38.5%
(d) 42.5%

300. Hari, Kamal and Lalit contested an election in which 6050 votes were polled and none of the votes were invalid. Kamal got 42% more votes than the total votes obtained by Hari and Lalit together. If Lalit obtained only 8% of the total polled votes, find the number of votes obtained by Hari.

SSC CGL TIER-II 26/10/2023

(a) 2016
(b) 1556
(c) 1912
(d) 1668

301. In an election between three candidates Arjun, Bhaskar and Saral contested for a post. Arjun got 50% votes more than Saral and Saral got 2% votes less than Bhaskar. The difference between the votes of Bhaskar and Saral is 1296. What is the half of the difference between the votes of Arjun and Bhaskar?

SSC CGL 14/07/2023 (Shift-03)

(a) 3888
(b) 13988
(c) 7766
(d) 15228

302. Two candidates P and Q contested in an election. 70% of the registered voter are P supporters If 60% of the P supporters and 30% of the Q supporters are expected to vote for candidate P, then what percentage of the registered voter are expected to vote for candidate P?

SSC CGL 06/12/2022 (Shift-01)

(a) 30%
(b) 51%
(c) 26%
(d) 47%

303. In an election, a voter has choices to vote for one candidate out of three candidates. There is also an option 'None Of The Above' (NOTA) to reject all candidates. The three candidates get votes that are 6 times NOTA. The winner gets votes that are twice the second runner-up's votes. The first runner-up gets 900 votes more than NOTA and defeats the second runner-up by 150 votes. What is the total number of votes polled?

SSC CHSL 05/07/2024 (Shift-04)

(a) 17715
(b) 15177
(c) 11025
(d) 11577

304. Three candidates P, Q and R participated in an election. P got 35% more votes than Q, and R got 15% more votes than Q. P overtook R by 2,412 votes. If 90% voter voted and no invalid or illegal votes were cast, then what was the number of voter in the voting list?

SSC CGL 09/12/2022 (Shift-01)

(a) 46,900
(b) 42,800
(c) 42,210
(d) 48,500

305. 28% of the people eligible to vote are between 20 to 25 years In an election 75% of those eligible to vote who were between 20 to 25 years actually voted. In that election the number of persons between 20 to 25 who actually voted was what percentage of those eligible to vote?

SSC Phase-X 01/08/2022 (Shift-03)

(a) 25%
(b) 21%
(c) 28%
(d) 22%

306. In an election, 35% of the voter voted for candidate P whereas 50% of the remaining voted for candidate Q. The remaining voter did not vote. If the difference between those who voted for candidate P and those who did not vote was 1000, the number of individuals eligible for casting a vote in that election was:

SSC Phase-X 01/08/2022 (Shift-03)

(a) 40000
(b) 60000
(c) 75000
(d) 55000

307. In a survey it was found that in a constituency, 55% of voter are male and the rest are female. 40% of the male voter are literate and $33\frac{1}{3}\%$ of the female voter are illiterate. What percentage of the voter are literate?

SSC CHSL 13/04/2021 (Shift-02)

(a) 52%
(b) 48%
(c) 54%
(d) 37%

308. In a constituency, 55% of the total number of voter are males and the rest are females. If 40% of the males are illiterate and 40% of the females are literate, then by what percentage is the number of illiterate females more than that of the illiterate males (correct to one decimal place)?

SSC CHSL 04/08/2021 (Shift-03)

(a) 21.5%
(b) 20.8%
(c) 16.4%
(d) 22.7%

309. In a constituency, 45% of the total number of voters are males and the rest are females. If 60% of the males are illiterate and 60% of the females are literate, then by what per cent is the number of illiterate females more than that of literate males? (Rounded off to 2 decimal places)

SSC CGL 18/09/2024 (Shift-01)

(a) 19.11%
(b) 27.23%
(c) 30.24%
(d) 22.22%

310. In an examination a candidate had to sit for three papers A, B, and C. The candidate secured 75% marks in Paper A, 80% marks in Paper B, and 60% marks in Paper C. If the weightage assigned to Papers A, B, and C were 40%, 50 % and 10 %, respectively, then find the weighted percentage of marks obtained by the candidate, when all the three papers were taken together.

SSC CGL 24/07/2023 (Shift-04)

(a) 77%
(b) 74%
(c) 72%
(d) 76%

◆ TYPE – XIII ◆
VENN DIAGRAM

311. In a school, the total no. of students who play tennis and cricket both is 180. In that school 70% of the total students play tennis and 60% of the total students play cricket. If the percentage of the students who do not play any game is 25% of the percentage of the students who play cricket, then find the total number of students?
(a) 500 (b) 600
(c) 400 (d) 480

312. 40% of the students in a school passed in maths, 50% of the students passed in english and the number of students who passed in both the subjects is 140.The percentage of students who failed in both the subjects is 30%. Find the number of students in the school?
(a) 600 (b) 700
(c) 490 (d) 560

313. In a village of 800 people, 60% speaks Hindi, 20% speak English only if the number of students who did not speak any language is equal to number of students who speaks both language then find out number of students who speaks both the languages?
(a) 320 (b) 160
(c) 200 (d) 180

314. A company conducted a survey for THE HINDU and TIMES OF INDIA by survey it is known that number of people who like both equal to the people who did not like anyone. 630 people likes only TIMES OF INDIA and 48% likes TIMES OF INDIA. If there are total 1750 people in survey then find out the % of people who likes only THE HINDU ?
(a) 40 (b) 25
(c) 30 (d) 60

315. In an examination 50% students passed in physics, 37.5% students passed in chemistry and 12.5% students passed in both. If in that exam the no. of girls is equal to the no. of failed students and 25% of the failed students are girls, which is 20, then find what percent of boys who failed?
(a) 16% (b) 25%
(c) 20% (d) 24%

316. In a college exam 43 passed in accounts, 42 passed in digital marketing and 40 passed in social science. In all the three exams 10 got passing marks. 22 passed accounts and digital marketing, 23 passed in accounts and social science, 16 passed in digital marketing and social science. Find how much percentage of the students passed only in two subjects to students passed only in one subject.
(a) 93.99% (b) 9.3%
(c) 11.11% (d) 95%

317. In an examination,53% students passed in Mathematics, 61% passed in Physics, 60% passed in Chemistry, 24% passed in Mathematics and Physics, 35% in Physics and Chemistry, 27% in Mathematics and Chemistry and 5% in none. The ratio of % of passes in Mathematics and Chemistry but not in Physics in relation to the % of passes in Physics and Chemistry but not in Mathematics is ?
(a) 7 : 5 (b) 5 : 7
(c) 4 : 5 (d) 5 : 4

318. In a class of 50 students.20 play hockey, 15 play cricket and 11 play football. 7 play both hockey and cricket, 4 play cricket and football.5 play Hockey and football. If 18 students don't play any of these given sports. Find the ratio of student who play all of these 3 sports to who play exactly two of these sports?
(a) 1 : 3 (b) 1 : 7
(c) 1 : 5 (d) 4 : 3

◆ TYPE – XIV ◆
COMMISSION

319. An agent gets 5% commission on all sales up to ₹10000 and 4% commission on all sales exceeding this amount. He gives ₹28700 from his sales to his company after deducting his commissions. Find his total sales.
(a) ₹30,000 (b) ₹24,000
(c) ₹28,000 (d) ₹32,000

320. A salesman is allowed 12% commission on the sale by him up to ₹15000 and additional bonus of 1% on sale made over ₹15000. If his total earnings are ₹7650. Find the total sales made by him?
(a) ₹56,000 (b) ₹50,000
(c) ₹60,000 (d) ₹64,000

321. A company allows 7% commission on total sales. If the salesman is appointed on a fixed salary of ₹3000 and 4% commission on the sales more than ₹10000, then the salesman gets ₹800 more. Find the total sales made by the salesman.
(a) ₹60,000 (b) ₹50,000
(c) ₹56,000 (d) ₹64,000

322. A company allows 13% commission on total sales. But if the salesman is appointed on a fixed salary of ₹ 4700 and 7% commission on the sales more than ₹12000, the salesman gets ₹620 more. Find the total sales made by the salesman.
(a) ₹50,000 (b) ₹52,000
(c) ₹57,000 (d) ₹54,000

323. A marketing agent earns a commission of 2% on first ₹2,00,000, 1.5% on next ₹ 2,00,000 and 1% on the remaining amount of sales made in a month. If the sales achieved by the agent for the month of April 2018 are ₹5,68,000. The commission earned is:-

SSC CPO 15/03/2019 (Shift-01)

(a) ₹8680 (b) ₹7730
(c) ₹8240 (d) ₹7105

324. Two saleswomen, Kavitha and Kalyani, are allowed 12% and 15% commission, respectively on the total sales made by them. Kavitha gets 3% and Kalyani gets 5% extra bonus on the sales over ₹20,000. If the difference in total earnings of both Kavitha and Kalyani is ₹7,600, then Kavitha's total earning is:

ICAR Mains, 08/07/2023 (Shift-2)

(a) ₹19,200 (b) ₹21,600
(c) ₹17,800 (d) ₹23,400

325. A salesman makes a commission of a% on the first ₹3000 worth of sales and b% commission on further sales. During the month of January he makes ₹960 from the total sales of ₹7000 and during February ₹1110 from a total sales of ₹8000. Find the value of a and b.
(a) 12%, 15% (b) 15%, 12%
(c) 10%, 15% (d) 12%, 10%

◆ TYPE – XV ◆
INCOME TAX

326. If rate of income tax is increased by 27%, net income is decreased by 3%. Find the rate of income tax?
(a) 6% (b) 8%
(c) 12% (d) 10%

327. The rate of income tax is increased, as a result, tax liability of a person increased by 12%, whereas his net income goes down by 3%. What is the new rate of income tax?
(a) 22.4% (b) 21.6%
(c) 20.8% (d) 24.8%

328. Income of a man is increased by 1800 and payable tax is decreased from 18% to 15%. In both cases 29.95% income is tax free. Find initial income if payable tax is same in both cases.
(a) ₹9000 (b) ₹15000
(c) ₹12000 (d) ₹10000

329. Income of a person is increased by 2000. Tax rate decreases from 14% to 12%. Payable tax is same as before. If in 1st and 2nd condition 20% and 30% of income is tax free. Find his current income.
(a) ₹6000 (b) ₹8000
(c) ₹5000 (d) ₹9000

330. A man's annual income has increased by Rs.x and his income was ₹28,800 but the tax on income that he has to pay reduced from 12% to 10%, while in both the situation 27% of the income is tax free, find the increase in income, if equal tax is paid in both cases?
(a) Rs.1440 (b) Rs.5760
(c) Rs.6000 (d) Rs.6500

331. Income of a person decreases by ₹3000 and rate of income tax increased from 15% to 18%. The ratio of paid tax is 3 : 2. If 29% income is tax free. Find initial income.
(a) ₹6750 (b) ₹5550
(c) ₹7750 (d) ₹6250

◆ TYPE – XVI ◆
MISCELLANEOUS QUESTIONS

332. A is 25% more than B, and B is 40% less than C. If C is 20% more than D, then A is what percentage less than D?
SSC CGL 20/04/2022 (Shift-03)
(a) 10% (b) 12%
(c) 9% (d) 11%

333. A is 25% more than B and B is 30% less than C. If C is 20% more than D, then by what percentage is A more than D?
SSC CPO 29/06/2024 (Shift-01)
(a) 3% (b) 6%
(c) 5% (d) 2%

334. The sum of the two numbers is 450. If the greater number is decreased by 4% and the smaller number is increased by 20%, then the number obtained are equal. The smaller number is:
SSC Phase XII 24/06/2024 (Shift-03)
(a) 144 (b) 164
(c) 200 (d) 176

335. A is 25% more than B, and B is 40% less than C. If C is 20% more than D, then by what percentage is A less than D?
SSC MTS 06/09/2023 (Shift-02)
(a) 5% (b) 15%
(c) 10% (d) 12%

336. If a number is first increased by 15%, then reduced by 15%, it results in 782. If the same number is first reduced by 25%, then increased by 25% and again reduced by 20%, then what will be the resulting number?
SSC CGL 16/08/2021 (Shift-03)
(a) 712 (b) 150
(c) 750 (d) 600

337. If 20% of a number is subtracted from a second number and the second number decreases to its 70%, then what is the ratio of the first number to the second number?
SSC Phase-XI 27/06/2023 (Shift-01)
(a) 3 : 2 (b) 4 : 3
(c) 2 : 3 (d) 3 : 4

338. The sum of two numbers is 680. If the bigger number is decreased by 15% and the smaller number is increased by 15%, then the resultant numbers are equal. Find the smaller number.
SSC CGL 13/12/2022 (Shift-02)
(a) 307 (b) 285
(c) 289 (d) 304

339. A invested 30% more than B, B invested 40% less than C, who invested ₹8,000. The average of the total amount invested by all of them together (to the nearest ₹) is:
SSC CGL 19/04/2022 (Shift-01)
(a) 6,347 (b) 6,417
(c) 6,215 (d) 6,143

340. The income of A is 30% less than the income of B and the income of B is 137.5% more than that of C. If the income of A is ₹28500 less than that of B, than income (in ₹) of C is:
SSC CGL 16/08/2021 (Shift-01)
(a) 40000 (b) 50000
(c) 48000 (d) 36000

341. A, B and C divided a certain sum among themselves. The average of the amounts with them is ₹4520. Share of A is $10\frac{2}{3}\%$ more than share of B and $33\frac{1}{3}\%$ less than share of C. What is the share of B (in ₹)?
SSC CGL 13/08/2021 (Shift-03)
(a) 3500 (b) 5976
(c) 3600 (d) 9384

342. A is 80% more than B and C is $48\frac{4}{7}\%$ less than the sum of A and B. C is what percent less than A?
SSC CGL TIER-II 15/11/2020
(a) 15% (b) 25%
(c) 30% (d) 20%

343. A number is decreased by 20% to get another number. The number so obtained is increased by 200% to get a third number. The difference of the third number and the original number is what percentage more or less than the difference of second and the third number?
SSC CGL 12/12/2022 (Shift-02)
(a) More, 15.7% (b) Less, 15.7%
(c) More, 12.5% (d) Less, 12.5%

344. $\frac{11}{5}$ of a number A is 22% of a number B. The number B is equal to 2.5% of a third number C. If the value of C is 5500, then the sum of 80% of A and 40% of B is:
SSC CGL 12/04/2022 (Shift-02)
(a) 88 (b) 75
(c) 48 (d) 66

345. Student A got 25 marks more than the student B and the marks of A were equal to the 60% of the sum of their marks. What are the marks obtained by A and B respectively?
SSC CHSL 14/03/2023 (Shift-03)
(a) 75, 100 (b) 75, 50
(c) 45, 120 (d) 55, 80

346. If Ram's income exceeds Shyam's income by 70% and Shyam's income is less than Sohan's income by 30%, then find the ratio of the incomes of Ram and Sohan.
SSC CPO 10/11/2022 (Shift-01)
(a) 119 : 100
(b) 121 : 102
(c) 120 : 101
(d) 118 : 99

347. The price of petrol shot up by 5%. Before the hike, the price was ₹82 per litre. A man travels 3045 km every month and his car gives a mileage of 15 km per litre. What is the increase in the monthly expenditure (to the nearest ₹) on the man's travel due to the hike in the petrol prices?
SSC CGL 12/04/2022 (Shift-01)
(a) 832 (b) 859
(c) 758 (d) 944

348. In an examination, 45 percent students passed in history and 60 percent students passed in hindi. If 8 percent failed in both the subjects, then what percentage students passed in both the subjects?
SSC CHSL 17/03/2023 (Shift-04)
(a) 15% (b) 10%
(c) 13% (d) 12%

349. Out of the total toffees, $\frac{1}{10}$ are wasted. 35% of the rest are given to S and $\frac{1}{8}$ of the total are given to N. If the toffees with N are 10 more than the wasted toffees, then how many toffees were given to S?
SSC CGL 25/07/2023 (Shift-01)
(a) 126 (b) 150
(c) 110 (d) 135

350. Ravi initially had a certain number of chocolates, while Bhanu initially had 80% of the number of chocolates that Ravi initially had. Ravi gave 10% of his chocolates to his sister while Bhanu received from his uncle another 35% of the number of chocolates he initially had. If Bhanu finally had 54 chocolates, how many chocolates did Ravi give to his sister?
SSC CHSL 09/08/2023 (Shift-02)
(a) 3 (b) 6
(c) 5 (d) 4

351. Mrudula starts her job with a certain monthly salary and earns a fixed increment every year. If her salary was Rs.28,400 after six years of service and Rs.52,997 after fifteen years, find her annual increment.
SSC CGL 11/09/2024 (Shift-01)
(a) Rs.12002 (b) Rs.1200
(c) Rs.2733 (d) Rs.1824

352. In a group of 250 persons, 40% are males and 60% are females. If 30 more females join the group, then what will be the percentage of females in the new group? (Correct to 2 decimal places)
SSC CHSL 02/07/2024 (Shift-01)
(a) 72.25% (b) 90.25%
(c) 64.29% (d) 62.58%

353. The price of an item is increased twice successively. The final price is ₹2,295 and initial price was ₹1,000. The percentage increment the second time was twice the percentage increment the first time. By what percentage was the price increased the second time?
SSC CGL 19/09/2024 (Shift-02)
(a) 35% (b) 65%
(c) 70% (d) 25%

354. The price of an article increases by 20% every year. If the difference between the price of the article at the end of the third year and at the end of the fourth year is ₹324, what is the price of the article at the end of the second year?

SSC MTS 08/10/2021 (Shift-02)

(a) ₹1350 (b) ₹1250
(c) ₹1260 (d) ₹1180

355. A person wants to buy 10 chairs. The total cost of 10 chairs is Rs. 4,500. After bargaining, the shopkeeper agrees to decrease the cost of each chair by 20%. Then, the person purchased 10% more chairs. What will be the cost of the chairs that he purchased?

SSC CHSL 03/07/2024 (Shift-02)

(a) ₹3,260 (b) ₹3,960
(c) ₹4,100 (d) ₹3,900

356. The population of a town increases annually by 20%. If the present population is 80 lakh, then what is the difference between the population three years ago and 2 years ago?

SSC CPO 29/06/2024 (Shift-02)

(a) 75592.6 (b) 85592.6
(c) 65592.6 (d) 925925.93

357. A person, while trading the shares of a particular company, observes that its price has gone down by 10% from the previous day. In anticipation of increment on the next day, he holds it for the next day. But the share price further falls down by another 8% of the previous day. Then he sells his shares and gets ₹12,420. How much could he have saved had he sold it the previous day?

SSC Phase XII 21/06/2024 (Shift-02)

(a) ₹1,080 (b) ₹1,220
(c) ₹1,260 (d) ₹1,140

358. While playing cards, a man loses 75% of his money in the first round, 75% of the remaining in the second round, and 75% of the remaining in the third round. If he is left with ₹100, how much money does he have initially?

SSC Phase-XI 27/06/2023 (Shift-02)

(a) ₹6,400 (b) ₹2,400
(c) ₹1,600 (d) ₹3,200

359. The expenditure on the cost of living of a man and his family is 60% of his salary. He gets two increment of 30% and 60% in his salary. If his saving increases by 250% of his initial saving, then the new cost of living expenditure is what percentage (rounded off to the nearest integer) of the increased salary?

SSC CGL 12/12/2022 (Shift-04)

(a) 32.7% (b) 43.6%
(c) 29.5% (d) 36.6%

360. The number of units manufactured by a company A was 12500 units in 2019 and 10625 units in 2020. While in company B, the production fell from 34000 units in 2019 to 30600 units in 2020. If X and Y are the percentage decrease in the number of units manufactured by company A and B respectively from 2019 to 2020, then what will be the ratio of X and Y?

SSC CGL 13/12/2022 (Shift-01)

(a) 5 : 3 (b) 3 : 4
(c) 3 : 2 (d) 8 : 5

361. In a manufacturing unit, it was noted that the price of raw material has increased by 25% and the labour cost has gone up from 30% of the cost of raw material to 38% of the cost of the raw material. What percentage of the consumption of raw material be reduced to keep the cost the same as that before the increase?

SSC CGL 11/04/2022 (Shift-03)

(a) 20.7% (b) 30.2%
(c) 24.6% (d) 25.5%

362. A software company has only 3 divisions that have 20, 30 and 40 employees, respectively. If the working percentage during a weekend was 20%, 30% and 40%, respectively, then the working percentage of the entire company during that weekend was approximately:

SSC CHSL 25/05/2022 (Shift-03)

(a) 0.0032 (b) 3.2
(c) 0.032 (d) 32

363. A man started off a business with a certain capital amount. In the first year, he earned 60% profit and donated 50% of the total capital (initial amount + profit), He followed the same procedure with the remaining capital after the second and the third year. If at the end of the three years, he is left with ₹15,360, what was the initial amount (in ₹) with which the man started his business?

SSC CGL 19/04/2022 (Shift-01)

(a) 20,000 (b) 30,000
(c) 25,000 (d) 32,000

364. A fruit seller sells 45% of the oranges that he has along with one more orange to a customer. He then sells 20% of the remaining oranges and 2 more oranges to a second customer. He then sells 90% of the now remaining oranges to a third customer and is still left with 5 oranges. How many oranges did the fruit seller have initially?

SSC CGL 19/04/2022 (Shift-03)

(a) 100 (b) 120
(c) 111 (d) 121

365. Vipul spends 30% of his monthly income on rent, 60% of the remaining on groceries, and 40% of the remaining on others. If he saves Rs.7056 in a month, then how much (in ?) does he spend on groceries?

SSC CGL 24/09/2024 (Shift-02)

(a) 18323 (b) 15230
(c) 17640 (d) 22386

366. A person spends 10% of his income on groceries, 10% on medicines, 20% on children's education, 15% on house rent, and he saves the remaining amount. If his monthly income is ₹30,000, find his savings.

SSC CHSL 04/07/2024 (Shift-01)

(a) ₹15,500 (b) ₹13,500
(c) ₹16,500 (d) ₹12,500

367. Ram spends 30% of his salary on food, 10% on house rent, 7% on entertainment, and 6% on conveyance. If at the end of a month his savings are ₹1,880, then his monthly salary is:

SSC CHSL 10/07/2024 (Shift-01)

(a) ₹4,000 (b) ₹4,450
(c) ₹5,000 (d) ₹55,00

368. From the salary of a software engineer, if 15% is used as house rent, 25% of the remaining is spent on household items, 25% of the remaining as income tax, and 15% of the remaining on clothing, then he is left with ₹10,404. Find his total salary.

SSC CHSL 02/07/2024 (Shift-02)

(a) ₹22,600 (b) ₹24,600
(c) ₹25,600 (d) ₹23,600

369. Pranav gave 30% of the money he had to his wife, and 86% of the remaining to his two children. Half of the amount left was spent on other things, and the remaining amount of ₹98,000 was deposited in the bank. How much money did he have initially?

SSC CHSL 08/07/2024 (Shift-02)

(a) ₹20,00,000 (b) ₹40,00,000
(c) ₹10,00,000 (d) ₹30,00,000

370. A man spends 35% of his monthly income on food and $\frac{4}{13}$ part of the remaining income on transport. He incurs some other expenses, but also saves ₹6,300 per month, the latter being equal to 20% of the balance remaining just after spending on food and transport. What is his monthly income (in ₹)?

SSC CHSL 02/07/2024 (Shift-04)

(a) 67,500 (b) 72,000
(c) 70,000 (d) 63,000

371. Swati earns a sum of ₹40,000, out of which she saves 25%. She spends the remaining amount on food and education in the ratio of 3 : 2. What is the percentage of expenditure incurred on education to her total income?

SSC CPO 29/06/2024 (Shift-02)

(a) 30% (b) 20%
(c) 60% (d) 40%

372. A person spends 40% of his salary on food items, 50% of the remaining on transport, and 30% of the remaining on clothes. After spending on food, transport and clothes, he saves ₹1,260 every month, what is his monthly salary?

SSC Phase XII 26/06/2024 (Shift-02)

(a) ₹10000 (b) ₹6000
(c) ₹7000 (d) ₹8000

373. Swastik saves 20% of his income while spends the remaining amount on food, rent, education and shopping. 15% of the income is spent on food, while ₹12,800 is spent on rent, ₹32,000 on education and ₹7,200 on shopping. The amount spent on shopping is 11.25% of the total expenditure. How much money (in ₹) is spent on food?

SSC CPO 03/10/2023 (Shift-02)

(a) 9600 (b) 12000
(c) 15000 (d) 10800

374. A family earns ₹75,000, out of which 10% is saved. 30% of the expenditure is incurred on education, while ₹30,375 is spent on health and the remaining amount is spent on food. What is the percentage of food expenditure to the total income?

SSC CPO 05/10/2023 (Shift-02)

(a) 20% (b) 21.5%
(c) 22.5% (d) 32.5%

375. Ayush spends 25% of an amount of money on an insurance policy, 26% on food, 23% on children's education and 19% on recreation. He deposits the remaining amount of ₹ 26,600 in the bank. What is the total amount (in ₹) that he spends on food and recreation together?

SSC CPO 05/10/2023 (Shift-03)

(a) 1,95,000 (b) 1,83,000
(c) 1,62,000 (d) 1,71,000

376. Out of the total income, a family saves 15% and the rest of the amount is spent on three types of expenditure – health, education and food in the ratio of 17 : 34 : 34. The income is ₹300 less than thrice the expenditure incurred on education. What is the difference between the savings and the expenditure incurred on health?

SSC Phase-XI 27/06/2023 (Shift-04)

(a) ₹300 (b) ₹350
(c) ₹2,250 (d) ₹500

377. Geeta buys an apartment and pays EMI for the same. His monthly income is ₹80,000. She spends 15% on her children's education, 40% on household chores, sends 10% to GPF, saves 15% in savings bank account and pays the remaining amount as EMI. What amount does she pay as EMI?

SSC CHSL TIER-II 26/06/2023

(a) ₹14,000 (b) ₹16,000
(c) ₹20,000 (d) ₹18,000

378. Bhavani spent 15% of his monthly income on kid's education and 20% on food. 40% of the remaining she spent on sports and 30% on transport. She is left with an amount of ₹10,257 after all these expenditures. What is Bhavani's monthly income?

SSC CPO 09/11/2022 (Shift-02)

(a) ₹45,800 (b) ₹48,000
(c) ₹52,600 (d) ₹81,965

379. Shiva's monthly salary is ₹75,000. He spends ₹12,000 on household items, ₹14,000 on LIC and mutual funds, ₹15,000 on his children's education, and keeps ₹10,000 for miscellaneous expenses. His savings are ₹21,000 per month and he donates the rest of the amount to an orphanage. The percentage of his income that he donates is:

SSC CGL 13/12/2022 (Shift-03)

(a) 3% (b) 6%
(c) 8% (d) 4%

380. Raju spends 10 percent and 20 percent of his income on transport & food respectively. He spends 30 percent of the remaining income on clothing. He saves rest of his income. If his saving is ₹26460, then what will be total expenditure on food and clothing together?

SSC CGL TIER-II (08/08/2022)

(a) ₹26420 (b) ₹22140
(c) ₹23440 (d) ₹24480

381. A family saves 30% of the total income and the savings amount to ₹600 less than half of the expenditure. If the expenditure is spent on health, food and education in the ratio of 3 : 5 : 6, then what amount of expenditure is spent on education?

SSC Phase-X 02/08/2022 (Shift-02)

(a) ₹3,600 (b) ₹1,800
(c) ₹7,200 (d) ₹8,400

382. Mr. Stark gave 30% of the money he had to Bruce. He also gave 30% of the remaining amount to each of Natasha, Captain and Vision. Half of the remaining amount he spent on miscellaneous items, and the remaining amount of ₹14,000 he deposited in Marvel's Fund. How much money did Mr. Stark initially have?

SSC MTS 20/07/2022 (Shift-02)

(a) ₹3,90,000 (b) ₹4,00,000
(c) ₹3,70,000 (d) ₹3,00,000

383. Aman gave 30% of his monthly income to his father and of the remaining income he gave 30% to his daughter and 25% to his wife. Aman invested the amount of money still remaining from his monthly income equally in three schemes. If he invested ₹ 42,000 in each scheme, what is Aman's monthly income (in ₹ thousand)?

SSC MTS 25/07/2022 (Shift-03)

(a) 300 (b) 400
(c) 200 (d) 500

384. Ramesh spends 40% of his monthly salary on food, 18% on house rent, 12% on entertainment, and 5% on conveyance. But due to a family function, he has to borrow ₹16,000 from a money lender to meet the expenses of ₹20,000. His monthly salary is:

SSC CPO 25/11/2020 (Shift-02)

(a) ₹18,000 (b) ₹16,500
(c) ₹16,000 (d) ₹15,000

385. A family income is ₹35,000 in a month. The family spends the income on various expenditures, viz., food, health, education, entert-ainment, and rent. After incurring all the expenditures, 8% is saved every month. The expenditure on health is 50% more than that of food. While food is three times of the expenditure on entertainment, the expenditure on health is half of the expenditure on education. The expenditure on rent is one-third of the combined expenditure on food, health and education. How much expenditure (in ₹) is incurred on education?

SSC CGL 25/07/2023 (Shift-02)

(a) 12600 (b) 8400
(c) 13200 (d) 7700

386. In a school, an exam was held for 80 marks in which 32 was the passing marks. Who among the following scored the minimum marks?

Note: Round off upto one decimal only.

SSC Phase XII 21/06/2024 (Shift-03)

(a) D, who got $\frac{12}{19}$ of the total marks
(b) B, who got $\frac{7}{11}$ of the total marks
(c) A, who got 72% marks in the exam
(d) C, who got 160% of the passing marks.

387. A certain number of students from school X appeared in an examination and 20% students failed. From school Y, 130% more students than that from school X, appeared in the same examination. If 90% of the total number of students appeared from both the schools passed, then what is the percentage of students from school Y who failed (correct to one decimal place)?

SSC CGL 17/08/2021 (Shift-01)

(a) 8.3% (b) 10%
(c) 6.4% (d) 5.7%

388. In an examination, there were two papers, A and B, and the maximum mark in each of the two papers was 10. However, the weights assigned to papers A and B were in the ratio 2 : 1, respectively. Riddhi scored 8 out of 10 in Paper B, and an overall 70% in the examination. How much did she score in Paper A out of 10?

SSC Phase XII 25/06/2024 (Shift-01)

(a) 6.5 (b) 5.5
(c) 6 (d) 5

389. Vikas gave 3 examinations. The respective ratio of marks scored by him in the 3 examinations is 3 : 5 : 6. The respective ratio of maximum marks of the 3 examination is 7 : 11 : 10. If he scored 50 percent marks in total, then in how many examination has he scored marks more than 50 percent?

SSC MTS 13/06/2023 (Shift-02)

(a) None of these (b) 1
(c) 3 (d) 2

390. In an engineering institution, a student's grade is assessed based on Internal tests (30%), assignments (30%) and external exams (40%). If a student scored 90% in internal tests, 95% in assignments and 75% in the external exams, then the overall grade of the student is:

SSC CHSL 27/05/2022 (Shift-02)

(a) 86.25% (b) 85.25%
(c) 86% (d) 85.50%

391. Some students (only boys and girls) from different schools appeared for an Olympiad exam. 20% of the boys and 15% of the girls failed the exam. The number of boys who passed the exam was 70 more than that of the girls who passed the exam. A total of 90 students failed. Find the number of students that appeared for the exam.

SSC CGL 11/04/2022 (Shift-01)

(a) 420 (b) 400
(c) 500 (d) 350

392. In an examination, B obtained 20% more marks than those obtained by A, and A obtained 10% less marks than those obtained by C. D obtained 20% more marks than those obtained by C. By what percentage are the marks obtained by D more than those obtained by A?

SSC CGL TIER II 03/02/2022

(a) $33\frac{1}{3}\%$ (b) $13\frac{1}{3}\%$
(c) $15\frac{1}{3}\%$ (d) $23\frac{1}{3}\%$

393. A class has five sections that have 25, 30, 40, 45 and 60 students, respectively. The pass percentage of these sections are 20%, 30%, 35%, 40% and 100%, respectively. The pass percentage of the entire class is:

SSC CPO 24/11/2020 (Shift-02)

(a) 87% (b) 63%
(c) 53% (d) 79%

394. Some students from school X appeared in an examination and 30% of them failed. 150% more students appeared in the same examination from school Y than the students from school X. If 80% of the total number of students who appeared from X and Y passed then what is the percentage of students who failed from Y?

SSC CGL TIER-II 15/11/2020

(a) 18% (b) 20%
(c) 16% (d) 24%

395. The income of A is 45% more than the income of B and the income of C is 60% less than the sum of the incomes of A and B. The income of D is 20% more than that of C. If the difference between the incomes of B and D is ₹13200, then the income (in ₹) of C is:

SSC CGL 13/08/2021 (Shift-01)

(a) 75,000 (b) 73,500
(c) 72,500 (d) 72,000

396. Three persons A, B and C donate 10%, 7% and 9% respectively of their monthly salaries to a charitable trust. Monthly salaries of A and B are equal and the difference between the donations of A and B is ₹900. If the total donation by A and B is ₹600 more than that of C, then what is the monthly salary (in ₹) of C?

SSC CGL 23/08/2021 (Shift-02)

(a) 60000 (b) 50000
(c) 45000 (d) 55000

397. In a workshop with 80 students and 10 resource persons, sweets were distributed at the end of the workshop. The amount spent for distributing sweets to each student was 30% of the total number of students and amount spent towards each resource person was 40% of the total number of students. The total amount spent for sweets distribution in the workshop was:

SSC CHSL 10/08/2021 (Shift-02)

(a) ₹2,420 (b) ₹2,440
(c) ₹2,400 (d) ₹2,240

398. Last year, Geeta's monthly salary was ₹12,000 and Seeta's monthly salary was ₹10,000. This year, Geeta's monthly salary is ₹14,400, while Seeta's monthly salary is ₹12,500. If the percentage increase in Seeta's monthly salary this year over her monthly salary last year is denoted by x%, and the percentage increase in Geeta's monthly salary this year over her monthly salary last year is denoted by y%, then what is the value of $\left(\frac{x-y}{y}\times 100\right)\%$?

SSC CHSL 04/07/2024 (Shift-03)

(a) 24 (b) 20
(c) 22 (d) 25

399. If decreasing 180 by x% gives the same result as increasing 60 by x%, then x% of 410 will be more than (x + 20)% of 210 (correct to two decimal places) by:

SSC CHSL 16/04/2021 (Shift-02)

(a) 37.57% (b) 36.57%
(c) 39.46% (d) 31.67%

400. If decreasing 110 by x% gives the same result as increasing 50 by x%, then x% of 650 is what percentage more than (x + 20)% of 180?
(correct to nearest integer)

SSC CPO 23/11/2020 (Shift-01)

(a) 80% (b) 90%
(c) 136% (d) 154%

401. If (x + 20)% of 250 is 25% more than x% of 220, then 10% of (x + 50) is what percent less than 15% of x?

SSC CGL Tier-II 15/11/2020

(a) $13\frac{1}{3}\%$ (b) $8\frac{1}{3}\%$
(c) $16\frac{2}{3}\%$ (d) $33\frac{1}{3}\%$

402. During a division, Pranjal mistakenly took as the dividend a number that was 10% more than the original dividend. He also mistakenly took as the divisor a number that was 25% more than the original divisor. If the correct quotient of the original division problem was 25 and the remainder was 0, what was the quotient that Pranjal obtained, assuming his calculations had no error?

SSC CGL 17/07/2023 (Shift-04)

(a) 21.75 (b) 21.25
(c) 28.75 (d) 22

403. While solving a problem, Suhas by mistake took a number as the dividend which was 10% less than the original dividend. He also mistakenly took a number as the divisor which was 20% less than the original divisor. If the correct quotient of the original question of division was 24 and the remainder was 0, then assuming that there was no error in his calculation, what was the quotient obtained by Suhas?

SSC CGL 19/07/2023 (Shift-01)

(a) 27 (b) 21.6
(c) 26.4 (d) 30

404. 42% of Ranita's weekly income is equal to 56% of Bhaskar's weekly income. If Bhaskar's weekly income was raised by ₹200, while Ranita's weekly income did not change, the ratio of the weekly incomes of Ranita and Bhaskar, respectively, would have been 5 : 4. What is Ranita's weekly income (in ₹)?

SSC CPO 29/06/2024 (Shift-01)

(a) 4200 (b) 3600
(c) 3000 (d) 4000

405. 57% of Ranita's weekly income is equal to 76% of Bhaskar's weekly income. If Ranita's weekly income was reduced by ₹400, while Bhaskar's weekly income did not change, the ratio of the weekly incomes of Ranita and Bhaskar, respectively, would have been 6 : 5. What is Bhaskar's weekly income (in ₹)?

SSC CPO 27/06/2024 (Shift-01)

(a) ₹2800 (b) ₹4000
(c) ₹3000 (d) ₹3200

406. The monthly salary of a person was ₹1,60,000. He used to spend on three heads — Personal and family expenses (P), Taxes (T) and Education loan (E). The rest were his savings. P was 50% of the income, E was 20% of P, and T was 15% of E. When his salary got raised by 30%, he maintained the percentage level of P, but E became 30% of P and T became 20% of E. The sum of the two savings (in ₹) is:

SSC CGL TIER II 03/02/2022

(a) 2,11,680 (b) 1,28,160
(c) 1,18,620 (d) 1,62,810

407. The monthly salary of a person was ₹75,000. He used to spend on Family Expenses (E), Taxes (T), Charity (C) and rest were his savings. E was 60% of the income, T was 20% of E, and C was 15% of T. When his salary got raised by 40%, he maintained the percentage level of E, but T became 30% of E and C became 20% of T. The ratio of the savings of his earlier salary to that of his present salary is:

SSC CPO 24/11/2020 (Shift-01)

(a) 655 : 644 (b) 325 : 337
(c) 644 : 655 (d) 337 : 325

408. The present population of a village (males and females) is 7640. If the number of males increases by 25% and the number of females increases by 15%, then the population will become 9214. The difference between the present population of males and females in the village is:

SSC CHSL 06/08/2021 (Shift-03)

(a) 940 (b) 960
(c) 820 (d) 920

409. In a certain year, the population of a city was 18000. If in the next year, the population of males increased by 5% and that of females increased by 7%, and the total population increased to 19200, then what was the ratio of the populations of males and females in that given year?

SSC CGL 20/07/2023 (Shift-01)

(a) 2 : 5 (b) 1 : 5
(c) 4 : 3 (d) 3 : 5

410. The present population of a village is 15280. If the number of males increases by 25% and the number of females increases by 15%, then the population will become 18428. The difference between present population of males and females in the village is:

SSC CGL 20/08/2021 (Shift-02)

(a) 1840 (b) 1380
(c) 920 (d) 2760

411. In a factory with 400 employees, the ratio of the number of male employees to that of female employees is 5 : 3. There are 87.5% regular employees in the factory. If 92% of male employees are regular employees, then what is the percentage of regular female employees?

SSC CGL 13/04/2022 (Shift-01)

(a) 80% (b) 78%
(c) 87.5% (d) 85%

412. The population of country A decreased by p% and the population of country B decreased by q% from the year 2020 to 2021. Here 'p' is greater than 'q'. Let 'x' be the ratio of the population of country A to the population of country B in the given year. What is the percentage decrease in 'x' from 2020 to 2021?

SSC CGL 06/12/2022 (Shift-02)

(a) $\frac{100(p-q)}{(100-q)}$

(b) $\frac{100(p-q)}{100+p}$

(c) $\frac{100(p-q)}{100-p}$

(d) $\frac{100(p-q)}{100+q}$

413. At the beginning of day 1 of a month, Rajesh has 500 eggs. He sells 20% of the eggs by the end of the day and added b% of the eggs at the beginning of the next day and sold 20% of the eggs at the end of the next day. This pattern continued up to the end of the third day of the month when he is left with 1024 eggs. The value of b is equal to:

SSC CHSL 02/07/2024 (Shift-04)

(a) 20 (b) 10
(c) 500 (d) 100

414. In a company, 35% of employees are from a science background and $\frac{1}{5}$th are from an arts background. The rest are either illiterate or with a commerce background. The number of illiterate is 300 which is $\frac{1}{2}$ of the commerce background. How many employees are from science or arts background?

SSC Phase XII 21/06/2024 (Shift-03)

(a) 1500 (b) 1200
(c) 1100 (d) 1300

415. During the lockdown, a state government gives 4.5 kg of rice to each person of a family at a cost price of ₹40 per kg. But the distributor uses false weight of 3.75 kg instead of 4.5 kg and distributes the rice. The accumulated rice was sold in the black market at double the price. He showed the government that he distributed 2700 kg of rice. When caught, he was made to pay a fine of 125% of what he earned in the black market. What was his fine amount?

SSC Phase XII 26/06/2024 (Shift-02)

(a) ₹36,000 (b) ₹45,000
(c) ₹28,000 (d) ₹54,000

416. Every month, a man consumes 20 kg of rice and 8 kg of wheat. The price of rice is 20% of the price of wheat, resulting in a total expenditure of Rs.300 per month for rice and wheat combined. If the price of wheat is increased by 20%, what percentage reduction in rice consumption is needed to maintain the same expenditure of Rs.300? (Given that price of rice and consumption of wheat is constant.)

SSC CGL 12/09/2024 (Shift-02)

(a) 40% (b) 38%
(c) 24% (d) 22%

SPEED BOOSTER HACKS

◆ Fraction to percentage conversion ◆

Fraction	Percentage	Fraction	Percentage	Fraction	Percentage
$\frac{1}{1}$ =	100%	$\frac{1}{7}$ =	$14\frac{2}{7}\%$	$\frac{1}{13}$ =	$7\frac{9}{13}\%$
$\frac{1}{2}$ =	50%	$\frac{1}{8}$ =	$12\frac{1}{2}\%$	$\frac{1}{14}$ =	$7\frac{1}{7}\%$
$\frac{1}{3}$ =	$33\frac{1}{3}\%$	$\frac{1}{9}$ =	$11\frac{1}{9}\%$	$\frac{1}{15}$ =	$6\frac{2}{3}\%$
$\frac{1}{4}$ =	25%	$\frac{1}{10}$ =	10%	$\frac{1}{20}$ =	5%
$\frac{1}{5}$ =	20%	$\frac{1}{11}$ =	$9\frac{1}{11}\%$	$\frac{1}{25}$ =	4%
$\frac{1}{6}$ =	$16\frac{2}{3}\%$	$\frac{1}{12}$ =	$8\frac{1}{3}\%$	$\frac{1}{40}$ =	$2\frac{1}{2}\%$

Chapter - 1 : Percentage

ANSWER KEY

1.	(c)	2.	(d)	3.	(c)	4.	(a)	5.	(d)	6.	(c)	7.	(d)	8.	(d)	9.	(a)	10.	(b)
11.	(b)	12.	(b)	13.	(a)	14.	(d)	15.	(c)	16.	(d)	17.	(c)	18.	(a)	19.	(b)	20.	(b)
21.	(a)	22.	(a)	23.	(c)	24.	(c)	25.	(d)	26.	(a)	27.	(a)	28.	(b)	29.	(d)	30.	(a)
31.	(c)	32.	(c)	33.	(c)	34.	(a)	35.	(b)	36.	(d)	37.	(c)	38.	(b)	39.	(a)	40.	(b)
41.	(d)	42.	(a)	43.	(a)	44.	(b)	45.	(a)	46.	(b)	47.	(a)	48.	(a)	49.	(b)	50.	(c)
51.	(a)	52.	(b)	53.	(a)	54.	(d)	55.	(c)	56.	(a)	57.	(b)	58.	(a)	59.	(d)	60.	(c)
61.	(d)	62.	(a)	63.	(c)	64.	(c)	65.	(c)	66.	(c)	67.	(c)	68.	(b)	69.	(c)	70.	(a)
71.	(a)	72.	(d)	73.	(d)	74.	(c)	75.	(a)	76.	(a)	77.	(c)	78.	(a)	79.	(c)	80.	(a)
81.	(c)	82.	(a)	83.	(c)	84.	(c)	85.	(a)	86.	(c)	87.	(b)	88.	(d)	89.	(a)	90.	(b)
91.	(b)	92.	(d)	93.	(a)	94.	(d)	95.	(d)	96.	(b)	97.	(b)	98.	(c)	99.	(c)	100.	(d)
101.	(c)	102.	(a)	103.	(a)	104.	(a)	105.	(d)	106.	(c)	107.	(c)	108.	(d)	109.	(d)	110.	(d)
111.	(a)	112.	(d)	113.	(d)	114.	(b)	115.	(a)	116.	(c)	117.	(b)	118.	(a)	119.	(a)	120.	(a)
121.	(a)	122.	(c)	123.	(a)	124.	(b)	125.	(a)	126.	(a)	127.	(d)	128.	(a)	129.	(c)	130.	(c)
131.	(d)	132.	(a)	133.	(a)	134.	(a)	135.	(c)	136.	(c)	137.	(c)	138.	(b)	139.	(b)	140.	(d)
141.	(c)	142.	(b)	143.	(b)	144.	(b)	145.	(c)	146.	(b)	147.	(a)	148.	(b)	149.	(b)	150.	(b)
151.	(b)	152.	(c)	153.	(a)	154.	(d)	155.	(b)	156.	(a)	157.	(d)	158.	(b)	159.	(b)	160.	(d)
161.	(b)	162.	(d)	163.	(d)	164.	(d)	165.	(c)	166.	(c)	167.	(c)	168.	(a)	169.	(c)	170.	(c)
171.	(d)	172.	(d)	173.	(a)	174.	(a)	175.	(a)	176.	(a)	177.	(a)	178.	(d)	179.	(c)	180.	(d)
181.	(a)	182.	(d)	183.	(c)	184.	(d)	185.	(a)	186.	(d)	187.	(b)	188.	(c)	189.	(b)	190.	(c)
191.	(d)	192.	(c)	193.	(c)	194.	(a)	195.	(d)	196.	(c)	197.	(b)	198.	(d)	199.	(d)	200.	(b)
201.	(d)	202.	(c)	203.	(b)	204.	(c)	205.	(a)	206.	(b)	207.	(b)	208.	(b)	209.	(c)	210.	(d)
211.	(b)	212.	(d)	213.	(b)	214.	(d)	215.	(c)	216.	(d)	217.	(d)	218.	(c)	219.	(c)	220.	(a)
221.	(c)	222.	(a)	223.	(a)	224.	(d)	225.	(a)	226.	(a)	227.	(a)	228.	(d)	229.	(d)	230.	(a)
231.	(b)	232.	(a)	233.	(b)	234.	(b)	235.	(d)	236.	(b)	237.	(a)	238.	(b)	239.	(b)	240.	(c)
241.	(a)	242.	(b)	243.	(d)	244.	(b)	245.	(d)	246.	(d)	247.	(d)	248.	(a)	249.	(b)	250.	(b)
251.	(a)	252.	(d)	253.	(d)	254.	(c)	255.	(d)	256.	(d)	257.	(b)	258.	(c)	259.	(a)	260.	(a)
261.	(a)	262.	(d)	263.	(c)	264.	(b)	265.	(b)	266.	(a)	267.	(c)	268.	(b)	269.	(b)	270.	(b)
271.	(b)	272.	(b)	273.	(a)	274.	(b)	275.	(c)	276.	(c)	277.	(a)	278.	(c)	279.	(a)	280.	(a)
281.	(b)	282.	(d)	283.	(a)	284.	(b)	285.	(b)	286.	(b)	287.	(d)	288.	(c)	289.	(d)	290.	(d)
291.	(a)	292.	(a)	293.	(a)	294.	(b)	295.	(d)	296.	(a)	297.	(c)	298.	(c)	299.	(d)	300.	(a)
301.	(d)	302.	(b)	303.	(c)	304.	(a)	305.	(b)	306.	(a)	307.	(a)	308.	(d)	309.	(d)	310.	(d)
311.	(c)	312.	(b)	313.	(b)	314.	(a)	315.	(b)	316.	(a)	317.	(b)	318.	(c)	319.	(a)	320.	(c)
321.	(a)	322.	(d)	323.	(a)	324.	(d)	325.	(a)	326.	(d)	327.	(a)	328.	(a)	329.	(b)	330.	(b)
331.	(a)	332.	(a)	333.	(c)	334.	(c)	335.	(c)	336.	(d)	337.	(a)	338.	(c)	339.	(a)	340.	(a)
341.	(c)	342.	(d)	343.	(d)	344.	(d)	345.	(b)	346.	(a)	347.	(a)	348.	(c)	349.	(a)	350.	(c)
351.	(c)	352.	(c)	353.	(c)	354.	(a)	355.	(b)	356.	(d)	357.	(a)	358.	(a)	359.	(a)	360.	(c)
361.	(c)	362.	(d)	363.	(b)	364.	(b)	365.	(c)	366.	(b)	367.	(a)	368.	(c)	369.	(a)	370.	(c)
371.	(a)	372.	(b)	373.	(b)	374.	(c)	375.	(d)	376.	(a)	377.	(b)	378.	(c)	379.	(d)	380.	(b)
381.	(a)	382.	(b)	383.	(b)	384.	(c)	385.	(a)	386.	(a)	387.	(d)	388.	(a)	389.	(b)	390.	(d)
391.	(c)	392.	(a)	393.	(c)	394.	(c)	395.	(b)	396.	(b)	397.	(d)	398.	(d)	399.	(c)	400.	(c)
401.	(c)	402.	(d)	403.	(a)	404.	(d)	405.	(c)	406.	(b)	407.	(a)	408.	(d)	409.	(b)	410.	(a)
411.	(a)	412.	(a)	413.	(d)	414.	(c)	415.	(b)	416.	(a)								

SOLUTIONS

1. (c) $12.75\% = \frac{12.75}{100} = \frac{1275}{10000} = \frac{51}{400}$

2. (d) 5% of 2% of 3

$= \frac{5}{100} \times \frac{2}{100} \times 3 = 0.003$

3. (c) On solving options,

(a) $12\% \text{ of } 625 = \frac{3}{25} \times 625 = 75$

(b) $15\% \text{ of } 555 = \frac{3}{20} \times 555 = 83.25$

(c) $10\% \text{ of } 720 = \frac{1}{10} \times 720 = 72$

(d) $9\% \text{ of } 845 = \frac{9}{100} \times 845 = 76.05$

Among all these options, 10% of 720 is least.

4. (a) $\frac{10}{100} \times \frac{24}{100} \times x = 240$

$\Rightarrow x = 10{,}000$

5. (d) Let number = x

$x \times \frac{50}{100} \times \frac{45}{100} = 27 \Rightarrow x = 120$

6. (c) ATQ,

$\Rightarrow 60\% \text{ of } 75 - \frac{1}{5} \text{ of } 25$

$= \frac{3}{5} \text{ of } 75 - \frac{1}{5} \text{ of } 25 = 45 - 5 = 40$

7. (d) $75\% = \frac{3}{4}$

$S = \frac{3}{4}T \Rightarrow \frac{S}{T} = \frac{3}{4} = 3 : 4$

8. (d) Girls toys = 75 − 18 = 57

$\% \text{ of girls toys} = \frac{57}{75} \times 100\% = 76\%$

9. (a) Boy : Girls

3 : 5

Total student (3 + 5) = 8 unit

$\% \text{ of boys} = \frac{3}{8} \times 100 = 37.5\%$

10. (b) $\underbrace{2500 \qquad 3000}_{\substack{\text{diff} \\ 500}}$

$\therefore \text{Increase\%} = \frac{500}{2500} \times 100$

$= 20\%$

11. (b) $\underbrace{\text{Rs.}200 \qquad \text{Rs.}234}_{\substack{\text{diff} \\ \text{Rs.}34}}$

$\therefore \text{Required } \% = \frac{34}{200} \times 100 = 17\%$

12. (b)

Before After

Salary:- $\underbrace{2{,}00{,}000 \qquad 2{,}40{,}000}_{\substack{\text{diff} \\ 40{,}000}}$

$\therefore \text{Required\%} = \frac{40{,}000}{2{,}00{,}000} \times 100$

$= 20\%$

Alternate Method:

Before After

Salary:- 2,00,000 2,40,000

5 : 6

$\therefore \text{Increase } \% = \frac{1}{5} \times 100 = 20\%$

13. (a) % Decrease in income

$= \frac{42800 - 37236}{42800} \times 100$

$= \frac{5564}{428} = 13\%$

14. (d) % Decrease in exp.

$= \frac{12800 - 11712}{12800} \times 100$

$= \frac{1088}{12800} \times 100 = 8.5\%$

15. (c) $\% \text{ Increase} = \frac{38640 - 34500}{34500} \times 100$

$= \frac{4140}{345} = 12\%$

16. (d) $30\% \rightarrow 153000$
$100\% \rightarrow 510000$

$\text{Monthly income} = \frac{510000}{12}$

$= 42{,}500$

Note: 153 is the multiple of 17
So, we can check multiple of 17 in option.

17. (c) Error Percentage

$= \frac{2\text{hr } 30.5 \text{ min} - 2\text{hrs } 25 \text{ min}}{2\text{hrs } 25 \text{ min}}$

$= \frac{5.5}{145} \times 100 = \frac{110}{29} = 3\frac{23}{29}\%$

18. (a) Population in 2022

$= 5000000 \times \frac{107.5}{100} \times \frac{107.5}{100}$

$= 5778125$

Alternate Method:

$7.5\% = \frac{3}{40}$

$$\begin{array}{ccc} \text{Old} & : & \text{New} \\ 40 & : & 43 \\ 40 & : & 43 \\ \hline 1600 & : & 1849 \\ \downarrow \times 3125 & & \downarrow \times 3125 \\ 5000000 & & \boxed{5778125} \end{array}$$

Note:- (1849 × 3125 = 5778125) can be done with the help of the digit sum method.

19. (b) 109% = 6300

$\therefore 100\% = \frac{6300}{109} \times 100 = ₹5779$

20. (b) Let, R has = 8 toffees
S has = 3 toffees
Now, R has remaining toffee
= 8 − 3 = 5
ATQ,
$R = S \times k\%$

$\Rightarrow 5 = k\% \times 3 \Rightarrow k = \frac{500}{3}$

21. (a) ATQ,

$\frac{30}{100} \times R = \frac{40}{100} \times S$

$\Rightarrow \frac{R}{S} = \frac{4}{3}$ (Income)

50% of R Income = 4 × 50% = 2

Then, Required% $= \frac{2}{3} \times 100 = 66\frac{2}{3}\%$

22. (a) $20\% = \frac{1}{5}\overset{+}{\big)} = \frac{6}{5}$ $\begin{array}{l} 6 \xrightarrow{\times 40} 240 \\ 5 \xrightarrow{\times 40} \boxed{200} \end{array}$

23. (c) $120\% = \frac{6}{5}\Big)$ 1 unit = 8

$\swarrow \times 8$

40

$\therefore$ Number = 40

Alternate Method:

$\text{No.} = \frac{8}{20} \times 100 = 40$

24. (c) $40\% = \frac{2}{5}\Big)$ 3 unit = 12

$\searrow$

5 unit = 20

Two-fifth of number $= \frac{2}{5} \times 20 = 8$

25. (d) Let the number be x.
ATQ,

$x \times \frac{70}{100} - 70 = 70$

$\Rightarrow \frac{70x}{100} = 140 \Rightarrow x = 200$

26. (a) Let, three numbers be

A : B : C
110 : 125 : 100
⇒A : B = 110 : 125 = 22 : 25

27. (a) $\text{I}^{st} : \text{II}^{nd} : \text{III}^{rd}$

39 : 65 : 100

$\therefore \text{Req. } \% = \frac{39}{65} \times 100 = 60\%$

28. (b) CS : EC : CE : ME
11 : 5 : 6 : 7

$\therefore \text{Req. } \% = \frac{11+7}{11+5+6+7} \times 100$

$= \frac{1800}{29} = 62.07\%$

29. (d) ATQ,
Let, the required no. = x

$\Rightarrow x + \frac{20}{100} \times 460 = \frac{920 \times 70}{100}$
$\Rightarrow x + 92 = 644$
$\Rightarrow x = 552$

30. (a) P : Q = 3 : 5

$\therefore \text{Required } \% = \frac{8-3}{3} \times 100\%$

$= 166\frac{2}{3}\%$

31. (c) Let, x be the number.
To increase it by 25%, we multiply it by 125 and divide by 100

We get, $\frac{125}{100} \times x = \frac{5}{4} \times x$

32. (c) Original : New

$$\begin{tikzcd} 5 & 8 \\ 8 \arrow[ur] & 5 \arrow[ul] \end{tikzcd}$$

25 : 64

$\therefore \% \text{ Error} = \frac{64 - 25}{25} \times 100 = 156\%$

Alternate Method:-

Let the number (LCM of 8 & 5) = 40

✓ $40\times\frac{5}{8}=25$

× $40\times\frac{8}{5}=64$

Diff. = 39

$\therefore$ % error = $\frac{39}{25}\times100=156\%$

33. (c) Original : New

$\frac{4}{5}$ ⟷ $\frac{5}{6}$

24 : 25

$\therefore$ % Change = $\frac{1}{24}\times100=4.17\%$

34. (a) R : W

$\frac{5}{3}$ ⟷ $\frac{3}{5}$

25 : 9

$\therefore$ % Error = $\frac{25-9}{25}\times100\%=64\%$

35. (b) $x-\frac{1}{x}=\frac{175}{400}x$

$\Rightarrow\frac{x^2-1}{x}=\frac{175x}{400}$

$\Rightarrow 400x^2-400=175x^2$

$\Rightarrow 225x^2=400$

$\Rightarrow x^2=\frac{400}{225}$ $\Rightarrow x=\frac{20}{15}=\frac{4}{3}$

36. (d) New fraction = $\left(\frac{3}{5}-\frac{2}{5}\right)\times\frac{6}{5}$

$=\frac{1}{5}\times\frac{6}{5}=\frac{6}{25}$

O : N

$\frac{3}{5}$ ⟷ $\frac{6}{25}$

5 : 2

% decrease = $\frac{5-2}{5}\times100=60\%$

37. (c) Let the price of 1 unit quantity = Rs.1

$\frac{1}{3}$ rd part is sugar

Q/P → 1 : 2
multiply by 6
Q/P → 6 : 12 ⇒ 18 unit
Q/P → 7 : 12 ⇒ 19 unit

(Increase by $\frac{7}{6}$)

$\underbrace{18 : 19}_{1}$

$\therefore$ Req. % = $\frac{1}{18}\times100=\frac{100}{18}\%$

38. (b) If he had 40% amount then expenditure = 100 − 40 = 60%

$$60\%\rightarrow(45000+30000)=75000 \quad (\times1250)$$
$$100\%\xrightarrow{\times1250}125000$$

Total amount = 125000

39. (a) Let, original fraction = $\frac{x}{y}$

A.T.Q,

$\Rightarrow\frac{x}{y}\times\frac{112\%}{92\%}=\frac{16}{17}$

$\Rightarrow\frac{x}{y}=\frac{92}{119}$

40. (b) $\frac{x\times(100+140)}{y\times(100-20)}=\frac{12}{7}\Rightarrow\frac{x}{y}=\frac{4}{7}$

41. (d) Let original fraction = $\frac{x}{y}$

$\Rightarrow\frac{x\times150}{y\times72}=\frac{25}{36}\Rightarrow\frac{x}{y}=\frac{1}{3}$

42. (a) Let the fraction = $\frac{x}{y}$

ATQ, $\frac{x\times160}{y\times140}=\frac{16}{63}\Rightarrow\frac{x}{y}=\frac{2}{9}$

43. (a) Let, the salary of employees in a factory = 100 unit
Now,

$$100\xrightarrow{-20\%}80,\quad 80\xrightarrow{+20}100$$

Required % = $\frac{20}{80}\times100=25\%$

44. (b) Let, somu salary = 100

$$\underset{70}{\text{Ramu}}\xrightarrow{+30}\underset{100}{\text{Somu}}$$

$\therefore$ Required % = $\frac{30}{70}\times100=42.86\%$

Alternate Method:

same, opp, sum

$30\%=\frac{-3}{10}$ = $\frac{+3}{7}$

$\therefore$ Required % = $\frac{3}{7}\times100=42.86\%$

45. (a) Shyam : Ram
80 : 100

$\underbrace{80 \to 100}_{\text{Diff. } 20}$

$\therefore$ Required % = $\frac{20}{80}\times100=25\%$

46. (b) Monica : Neha
Income → 100 : 105

$\underbrace{100 \to 105}_{\text{Diff. } 5}$

$\therefore$ Required % = $\frac{5}{105}\times100=4\frac{16}{21}\%$

47. (a) $\frac{R}{S}=\frac{102.5}{100}=\frac{41}{40}$

Required% = $\frac{41-40}{41}\times100=2.43\%$

48. (a) Old : New
Time → 4 : 3
Speed → 3 : 4

$\underbrace{3 \to 4}_{\text{Diff. } 1}$

$\therefore$ Required % = $\frac{1}{3}\times100=33\frac{1}{3}\%$

49. (b) Radius = r
Circumference = $2\pi r$
If the radius is increased by 20% then the circumference of the circle is also increased by 20%

50. (c) ∵ Side = a
Surface area of cube = $6a^2$

% Change = $-12-12+\frac{144}{100}$
$=-24+1.44=-22.56\%$
(Negative sign show decrease)

Alternate Method:

$12\%\rightarrow\frac{3}{25}$

Side → 25 : 22
Area → $(25 : 22)^2$
625 : 484

$\underbrace{625 \to 484}_{-141}$

% Decrease = $\frac{141}{625}\times100\%=22.56\%$

51. (a) $5\%\uparrow=\frac{1}{20}$

Surface area of sphere = $4\pi r^2$

Old : New
20 : 21
20 : 21
400 : 441

$\underbrace{400 \to 441}_{\text{diff } 41}$

$\therefore$ Req. % = $\frac{41}{400}\times100=10.25\%$

Alternate Method:

Successive increase of 5% and 5%

$=\left(5+5+\frac{5\times5}{100}\right)\%=10.25\%$

52. (b) Area of sphere = $4\pi r^2$
% Increase in surface area

$=\left(25+25+\frac{25\times25}{100}\right)\%=56.25\%$

Alternate Method:

Old : New
4 : 5
4 : 5
16 : 25

$\underbrace{16 \to 25}_{+9}$

% Increase in area = $\frac{9}{16}\times100$
= 56.25%

53. (a) Area of square = a^2

Old : New
20 : 21
20 : 21
400 : 441

Required % = $\frac{441-400}{400}\times100$
= 10.25%

Alternate Method:

Successive increase of 5% and 5%

$=\left(5+5+\frac{5\times5}{100}\right)\%=10.25\%$

54. (d) Percentage change in area of lawn

$=-8+15-\frac{15\times8}{100}=15-8-1.2$

$=15-9.2=5.8\%$ increase

55. (c) % Increased in area

$=7+7+\frac{7\times7}{100}=14.49\%$

56. (a) Area of rectangle = $l \times b$

% Change = 13 − 13 − $\frac{13\times13}{100}$

= 1.69% decreased

57. (b) Surface area of sphere = $4\pi r^2$

So, effective change in area

= − 48 − 48 + $\frac{48\times48}{100}$

= − 96 + 23.04 = − 72.96%

(Negative sign shows decrement)

58. (a) Area of rectangle = $l \times b$

So, % increase in area

= 8 + 5 + $\frac{8\times5}{100}$ = 13.4%

59. (d) Area of rectangle = $l \times b$

O : N
Length (l) → 100 : 108
Breadth (b) → 100 : 90
Area → 10000 : 9720

% Decrease in area

= $\frac{10000-9720}{10000}\times100$

= $\frac{280}{100}$ = 2.8% decrease

Alternate Method:

% Change in Area

= $\left(x+y+\frac{xy}{100}\right)\%$

= $\left(8-10-\frac{8\times10}{100}\right)\%$ = − 2.8%

(Negative sign shows decrease)

60. (c)

$$\begin{tikzcd}[column sep=small] & 140 \arrow[dd, bend left, "+20"] \\ 100 \arrow[ur, dash] \arrow[dr, dash] & \\ & 160 \end{tikzcd}$$

∴ Required % = $\frac{20}{140}\times100 = \frac{100}{7}$

= 14.28%

61. (d) Surface area of sphere = $4\pi r^2$

Radius → 6 : 7
Area → 36 : 49

Increase in surface area

= $\frac{13}{36}\times100$ = 36.1%

62. (a) Original : Increased

1 : 3
1 : 3
$\underbrace{1 \qquad 9}_{\text{diff } 8}$

Required% = $\frac{8}{1}\times100$ = 800%

63. (c) Surface area of sphere = $4\pi r^2$

Old New
Radius (r) → 1 : 2
Area (r^2) → 1 4

$\underbrace{1 \quad 4}_{+3}$

% Increase = $\frac{3}{1}\times100$ = 300%

64. (c) If we decrease the side of square by 10% this will result into 19% decrement in area, vice-versa

Side ∝ diagonal

So, Decrement in diagonal = 10%

65. (c) Volume of sphere = $\frac{4}{3}\pi r^3$

O : N
25 : 28
25 : 28
25 : 28
15625 : 21952

$\underbrace{15625 \quad 21952}_{\text{Diff. } 6327}$

% increase in volume

= $\frac{6327}{15625}\times100$ = 40.49%

Alternate Method:

Successive increase of (12%, 12%, 12%)
= 40.4928% ≈ 40.49%

66. (c) $20\% = \frac{+1}{5}$

Volume of sphere = $\frac{4}{3}\pi r^3$

V_O V_N
r→5 6
r→5 6
r→5 6
V→125 216

$\underbrace{125 \quad 216}_{91}$

∴ % Change increment = $\frac{91}{125}\times100$
= 72.8%

Alternate Method:

Equivalent successive % increment of 20% for 3 cycle = 72.8%

67. (c) Increased in volume

= $\left(6+8+\frac{6\times8}{100}\right)\%$ = 14.48%

Alternate Method:

6% = $\frac{+3}{50}$, 8% = $\frac{+2}{25}$

Volume of cuboid = $l \times b \times h$

Length → 50 : 53
Breath → 25 : 27
Height → h : h
1250 1431

$\underbrace{1250 \quad 1431}_{181}$

∴ % Increase in volume = $\frac{181}{1250}\times100$
= 14.48%

68. (b) Volume of cone = $\frac{1}{3}\pi r^2h$,

25% = 25% ↑ = $\frac{1}{4}$

Original New
r^2 → 16 : 25
h → 4 : 5
64 125

∴ % Change = $\frac{125-64}{64}\times100$
= 95.31%

69. (c) Volume of sphere = $\frac{4}{3}\pi r^3$

V_{orig} V_{new}
$(10)^3$: $(13)^3$
1000 : 2197

∴ % Increase = $\frac{2197-1000}{1000}\times100$
= 119.7%

70. (a) $10\% = \frac{1}{10}\,(+) = \frac{11}{10}$

Volume of cone = $\frac{1}{3}\pi r^2h$

Old New
Base radius (r) → 10^2 : 11^2
Height (h) → 10 : 11
Volume (v) → 1000 : 1331

∴ % Increase in volume

= $\frac{1331-1000}{1000}\times100$

= 33.1%

71. (a) Volume of cuboid = LBH

Old : New
Length (L) → 5 : 6
Breadth (B) → 4 : 5
Height (H) → 10 : 7
Volume (V) → 20 : 21

∴ % Change = $\frac{1}{20}\times100$ = 5%

(Increase)

72. (d) $15\% = \frac{3}{20}$; $25\% = \frac{1}{4}$; $60\% = \frac{3}{5}$

Volume of cuboid = $l \times b \times h$

l→ 20 : 17
b → 4 : 3
h → 5 : 8
50 51

$\underbrace{50 \quad 51}_{+1}$

∴ Required % = $\frac{1}{50}\times100$

= 2% increase

73. (d) Required%

= −50% + 50% − $\frac{50\%\times50\%}{100}$

= − 25%

Hence, Arun's salary get loss by 25%

Alternate Method:

If a number is increased by x% and then it is reduced by x% again, then percentage change will be a decrease of $\frac{x^2}{100}$%

⇒ $\frac{50^2}{100}$% = 25%

74. (c) Equivalent price

= $\left(25+25+\frac{25\times25}{100}\right)\%$

= 50 + 6.25 = 56.25%

Alternate Method:

$25\% = \frac{1}{4}$

4 5
4 5
16 25

$\underbrace{16 \quad 25}_{9}$

∴ Required % = $\frac{9}{16}\times100$ = 56.25%

75. (a) $100 \xrightarrow{+50\%} 150 \xrightarrow{+50\%} 225$

∴ Gain% = $\frac{125}{100}\times100$ = 125%

Alternate Method:

Overall gain = 50 + 50 + $\frac{50 \times 50}{100}$

= 100 + 25 = 125%

Alternate Method:

50% = $\frac{1}{2}$

Old   New
2 : 3
2 : 3
4   9
diff.
5

∴ Total gain % = $\frac{5}{4}$ × 100 = 125%

76. (a) $100 \xrightarrow{+10\%} 110 \xrightarrow{-10\%} 99$

1% loss

Alternate Method:

If a number is increased by x% and then it is reduced by x% again, then percentage change will be a decrease of $\frac{x^2}{100}$%

⇒ $\frac{10^2}{100}$% = 1%

77. (c) Original : Resultant
4 : 5
25 : 21
20 : 21
Diff. = 1

% Increase = $\frac{1}{20}$ × 100 = 5%

Alternate Method:

Net change

= 25% − 16% − $\frac{25 \times 16}{100}$%

= 9% − 4% = 5% (Increase)

> **SMART APPROACH:-**
> Since the increment value 25% is greater than the decrement value 16%, the resultant number must be bigger than the original number. Among the given options, only option (c) satisfies this condition.

78. (a) Effective increase in salary

= 25 − 12 − $\frac{25 \times 12}{100}$ = 13 − 3 = 10%

Alternate Method:

Old   New
4   5
25 : 22
100 : 110
diff.
10

∴% increase = $\frac{10}{100}$ × 100 = 10%

79. (c) 20% = $\frac{1}{5}$, 18% = $\frac{9}{50}$

Old : New
No. of employees → 5 : 6
Wages per head → 50 : 41
Total wages → 250 : 246
diff
4

∴ % decrease = $\frac{4}{250}$ × 100% = 1.6%

Alternate Method:

% Change = $\left(20 - 18 - \frac{20 \times 18}{100}\right)$%

= (2 − 3.6)% = − 1.6%

(− ve sign shows decrease)

80. (a) Old : New
20 : 23
10 : 11
200 : 253
diff.
53

Required % = $\frac{53}{200}$ × 100 = 26.5%

Alternate Method:

Single equivalent % increase

= $\left(15 + 10 + \frac{15 \times 10}{100}\right)$%

= (25 + 1.5)% = 26.5%

81. (c) Present : After
25 : 21
100 : 121
2500 : 2541
diff.
41

Required % = $\frac{41}{2500}$ × 100 = 1.64%

Alternate Method:

Net increase = $\left(-16 + 21 - \frac{16 \times 21}{100}\right)$%

= 5 − 3.36 = 1.64%

82. (a) Old : New
25 : 36
10 : 7
250 : 252
diff
2

Req. % = $\frac{2}{250}$ × 100 = 0.8% ~ 1%

Alternate Method:

Net change = $\left(44 - 30 - \frac{44 \times 30}{100}\right)$%

= (14 − 13.2)% = 0.8% ~ 1%

83. (c) Old price   New price
5 : 7
20 : 11
100 : 77
−23

∴ % change in final price = −23%

Alternate Method:

Successive (40%, − 45%)

= 40 − 45 − $\frac{40 \times 45}{100}$ = −5 −18

= −23%

84. (c) % change in original number

= $\left(-18 + 25 - \frac{18 \times 25}{100}\right)$%

= (7 − 4.5)% = 2.5% increase

85. (a) Income in 2022

= 21000 × $\frac{11}{\ }$ × $\frac{11}{10}$ = ₹25410

86. (c) 30% $\frac{3}{10}$) = $\frac{7}{10}$,

10% = $\frac{1}{10}$) = $\frac{9}{10}$

Area of rectangular field = l × b

Old : New
Length → 10 : 7
Breadth → 10 : 9
Area → 100 : 63
37

∴ Decrease % = $\frac{37}{100}$ × 100 = 37%

Alternate Method:

Decrease in area = 30 +10 − $\frac{30 \times 10}{100}$

= 37%

87. (b) Old : New
10 : 11
5 : 6
50 : 66
Diff.
16

∴ Required % = $\frac{16}{50}$ × 100 = 32%

Alternate Method:

Successive increase of 10% and 20%

= $\left(10 + 20 + \frac{10 \times 20}{100}\right)$% = 32%

88. (d) 25% ↓ = $\frac{1}{4}$, 20% ↑ = $\frac{1}{5}$

Old : New
4 : 3
5 : 6
20 : 18
Diff.
2

∴ % decrease = $\frac{2}{20}$ × 100 = 10%

89. (a) Successive decrease

= 15% + 20% − $\frac{15\% \times 20\%}{100}$

= 35 − 3 = 32%

90. (b) Total number of full years from 2018 to 2021 = 4 yrs

∵ 20% = $\frac{1}{5}$

2018   2019   2020   2021
$5 \xrightarrow{+20\%} 6 \xrightarrow{-20\%} 4.8 \xrightarrow{+20\%} 5.76$
+0.76

∴ % Increase = $\frac{0.76}{5}$ × 100 = 15.2%

Alternate Method:

	Old	New
2018	5	6
2019	5	4
2020	5	6
	125	144

∴ Overall % increase

$$= \frac{144-125}{125} \times 100 = \frac{1900}{125} = 15.2\%$$

91. (b) Net effect $= 5 - 10 - \frac{5 \times 10}{100}$

$= -5.5$ (decreased)

92. (d)

Original : Resultant
20 : 27
4 : 3
80 : 81

Diff. = 1

$$\% \text{ Increase} = \frac{1}{80} \times 100 = 1\frac{1}{4}\%$$

SMART APPROACH:-

Net change

$$= \left(35 - 25 - \frac{35 \times 25}{100}\right)\%$$

$$= \left(10 - 8\frac{3}{4}\right)\%$$

$$= +1\frac{1}{4}\%$$

Note:- '+' sign denotes increment.

93. (a) $x + y + z + \frac{(xy + yz + zx)}{100} + \frac{xyz}{100^2}$

Total percentage increase

$$= (10 + 5 + 15) + \frac{(10 \times 5 + 5 \times 15 + 15 \times 10)}{100} + \left(\frac{10 \times 5 \times 15}{10000}\right)$$

$$= 30 + 2.75 + \frac{750}{10000}$$

$$= 30 + 2.75 + 0.075$$

$$= 32.825\% = 32\frac{33}{40}\%$$

Alternate Method:

10% ↑, 5% ↑, 15% ↑

$10\% = \frac{1}{10}$, $5\% = \frac{1}{20}$, $15\% = \frac{3}{20}$

Original : Increased
10 : 11
20 : 21
20 : 23
4000 5313

Diff. = 1313

$$\text{Total \% increase} = \frac{1313}{4000} \times 100 = 32\frac{33}{40}\%$$

94. (d) Correct value

$$= 100 \xrightarrow{+20\%} 120 \xrightarrow{+30\%} 156$$

$$\text{Resultant value} = \frac{100 \times 78}{100} = 78$$

$$\text{Required\%} = \frac{78}{156} \times 100 = 50\%$$

95. (d) Let price of the machine after three years = x

ATQ,

$$8000 \times \frac{19}{20} \times \frac{9}{10} \times \frac{17}{20} = x \Rightarrow x = 5814$$

96. (b) $10\% = \frac{1}{10}\downarrow$, $30\% = \frac{3}{10}\uparrow$

$20\% = \frac{1}{5}\downarrow$

10 : 9
10 : 13
5 : 4
250 : 234

diff.
16

$$\therefore \text{Required \%} = \frac{16}{250} \times 100 = 6\frac{2}{5}\%$$

Alternate Method:

Net change for 10%↓ and 30%↑

$$= -10 + 30 - \frac{10 \times 30}{100} = 17\%$$

Net change for 17%↑ and 20%↓

$$= 17 - 20 - \frac{17 \times 20}{100} = -6\frac{2}{5}\%$$

(- ve sign shows decrease)

97. (b) Let the number be 100.

$$100 \xrightarrow{+12\%} 112 \xrightarrow{+23\%} 137.76 \xrightarrow{-34\%} 90.92$$

Decrease → 9.08

$$\therefore \text{Required \%} = \frac{9.08}{100} \times 100$$

$= 9.08 \sim 9\%$ (decrease)

Alternate Method:

Old : New
25 : 28
100 : 123
50 : 33
31250 : 28413

diff.
2837

$$\text{Required \%} = \frac{2837}{31250} \times 100$$

$= 9.08\% \sim 9\%$ (decrease)

98. (c) $1\frac{3}{5}\%\uparrow, 1\frac{3}{5}\%\downarrow, 1\frac{3}{5}\%\uparrow$

$1\frac{3}{5}\% = \frac{8}{5}\% = 1.6\%$

Now, 1.6%↑ 1.6%↓

Equivalent %

$$= 1.6 - 1.6 - \frac{1.6 \times 1.6}{100}$$

$= -0.0256\%$

Again – 0.0256% & 1.6%↑

Equivalent %

$$= -0.0256 + 1.6 - \frac{0.0256 \times 1.6}{100}$$

$= 1.5744 - 0.0004096$

= 1.57 % increase

Alternate Method:

$1\frac{3}{5}\% = \frac{8}{5}\% = \frac{2}{125}$

Old : New
I → 125 : 127
II → 125 : 123
III → 125 : 127
1953125 : 1983867

$$\therefore \% \text{ Increase} = \frac{30742}{1953125} \times 100$$

$\approx 1.57\%$

99. (c) Successive decrease

$$= 25 + 25 - \frac{25 \times 25}{100}$$

$= 50 - 6.25 = 43.75\%$

Successive increase

$$= 25 + 25 + \frac{25 \times 25}{100} = 56.25\%$$

Required %

$$= \frac{56.25 - 43.75}{56.25} \times 100\%$$

$$= \frac{12.5}{56.25} \times 100\% = 22.22\%$$

Alternate Method:

Successive decrease

$$= 25 + 25 - \frac{25 \times 25}{100}$$

$= 50 - 6.25 = 43.75\%$

Successive increase

$$= 25 + 25 + \frac{25 \times 25}{100} = 56.25\%$$

Increase : Decrease
56.25 : 43.75
9 : 7

$$\therefore \text{Required \%} = \frac{2}{9} \times 100\%$$

$= 22.22\%$

100. (d) Net Increment for two successive increment of 30 %

$$= 30 + 30 + \frac{30 \times 30}{100} = 69\%$$

Net Decrement for two successive decrement of 30 %

$$= -30 - 30 + \frac{30 \times 30}{100} = -51\%$$

$$\therefore \text{Required \%} = \frac{69 - 51}{51} \times 100$$

$$= \frac{18}{51} \times 100 = 35.29\%$$

101. (c) $18\% = \frac{+9}{50}$, $15\% = \frac{-3}{20}$, $3\% = \frac{-3}{100}$

Present : New
1st day → 50 : 59
2nd day → 20 : 17
3rd day → 100 : 97
100000 : 97291

diff
2709

$$\therefore \text{Decrease \%} = \frac{2709}{100000} \times 100$$

$= 2.709\% \sim 2.7\%$

Alternate Method:

Successively 18% increase and 15% decrease

$$= 18 - 15 - \frac{18 \times 15}{100} = 3 - 2.7 = 0.3$$

Again,

0.3% increase and 3% decrease

$$= 0.3 - 3 - \frac{3 \times 0.3}{100} = -2.7 - 0.009$$

$= -2.709\% \sim -2.7\%$

(–ve sign shows decrease)

102. (a) $15\% = \frac{3}{20}$, $25\% = \frac{1}{4}$, $6\% = \frac{3}{50}$

Population after 3 year

$$= 15000 \times \frac{23}{20} \times \frac{5}{4} \times \frac{47}{50} = 20269$$

103. (a) Let salary be 100 units.

Increased salary

$$= 100 \times \frac{5}{2} = 250 \text{ unit}$$

Check option wise,

I. Increment = 25%

Then,

II. Increment = 4 × 25 = 100%

So, $\textcircled{100} \xrightarrow{+25\%} 125 \xrightarrow{+100\%} 250$

It satisfy the condition.

104. (a)

$$\begin{array}{lccc} & \text{Initial} & & \text{New} \\ \text{Price} \rightarrow & 100 & : & 107 \\ \text{Consumption} \rightarrow & \underbrace{107 \;\; : \;\; 100}_{-7} \end{array}$$

$$\therefore \text{Required \%} = \frac{7}{107} \times 100 = 6\frac{58}{107}\%$$

105. (d)

$$\begin{array}{lccc} & \text{Initial} & : & \text{Final} \\ \text{Price} \rightarrow & 4 & : & 3 \\ \text{Consumption} \rightarrow & \underbrace{3 \;\; : \;\; 4}_{\text{Diff.} = 1} \end{array}$$

$$\text{Required percentage} = \frac{1}{3} \times 100 = 33.33\%$$

Note: price $\propto \frac{1}{\text{consumption}}$

Alternate Method:

$$\text{Increase\%} = \frac{25}{100-25} \times 100$$

$$= \frac{25}{75} \times 100 = 33.33\%$$

106. (c)

$$\begin{array}{lccc} & \text{O} & : & \text{N} \\ \text{Price} & \rightarrow 5 & : & 6 \\ \text{Consumption} & \rightarrow 6 & : & 5 \end{array}$$

$$\therefore \text{Required \%} = \frac{6-5}{6} \times 100 = 16.7\%$$

Alternate Method:

% increase = 20%

Then, % decrease in consumption

$$= \frac{20}{120} \times 100 = 16.7\%$$

107. (c) $$45\% = \overset{\text{same}}{\overset{\text{opp}}{\frac{+9}{20}}} \underset{\text{sum}}{\longrightarrow} = \frac{-9}{29}$$

$$\therefore \text{Required \%} = \frac{9}{29} \times 100 = 31.03 \sim 31\%$$

108. (d) $40\% = \frac{2}{5}$

$$\begin{array}{lccc} & \text{Old} & : & \text{New} \\ \text{Price} \rightarrow & 5 & : & 7 \\ \text{Consuption} \rightarrow & \underbrace{7 \;\; : \;\; 5}_{2} \end{array}$$

$$\therefore \text{Req. \%} = \frac{2}{7} \times 100 = \frac{200}{7} = 28\frac{4}{7}\%$$

109. (d) $35\% = \frac{+7}{20}$

ATQ,

$$\begin{array}{lccc} \text{Price} \rightarrow & 20 & : & 27 \\ \text{Consumption} \rightarrow & \underbrace{27 \;\; : \;\; 20}_{-7} \end{array}$$

% decrease in consumption

$$= \frac{7}{27} \times 100 = 25\frac{25}{27}\%$$

110. (d)

$$\begin{array}{lccc} \text{Production} \rightarrow & 4 & : & 3 \\ \text{Working hour} \rightarrow & \underbrace{3 \;\; : \;\; 4}_{+1} \end{array}$$

% Increased in working hour

$$= \frac{1}{3} \times 100 = 33\frac{1}{3}\%$$

111. (a) consumption of CNG $\propto \frac{1}{\text{price of CNG}}$

$65\% = \frac{13}{20}$

$$\begin{array}{lccc} \text{Price} \rightarrow & 20 & : & 33 \\ \text{Consumption} \rightarrow & \underbrace{33 \;\; : \;\; 20}_{13} \end{array}$$

$$\therefore \text{Required \%} = \frac{13}{33} \times 100 = 39.39\%$$

112. (d) Income = price × sale

$$\begin{array}{lccc} \text{Price} \rightarrow & 8 & : & 9 \\ \text{Sale} \rightarrow & 200 & : & 217 \\ \text{Income} \rightarrow & 8 \times 200 & : & 9 \times 217 \\ & \underbrace{1600 \;\; : \;\; 1953}_{\text{Diff.} = 353} \end{array}$$

$$\therefore \text{\% Change} = \frac{353}{1600} \times 100 = 22.0625\%$$

Alternate Method:

$$\text{\% Change} = \left(12.5 + 8.5 + \frac{12.5 \times 8.5}{100}\right)\%$$

$$= 21 + 1.0625 = 22.0625\%$$

113. (d) Given,

$$\begin{array}{lccc} & \text{Initial} & : & \text{Final} \\ \text{Entry fee} \rightarrow & 4 & : & 3 \\ \text{People} \rightarrow & 2 & : & 3 \\ \hline \text{Collection} \rightarrow & 8 & : & 9 \end{array}$$

$$\therefore \text{Change} = \frac{1}{8} \times 100 = 12.5\% \text{ increase}$$

114. (b) $3\frac{1}{8}\% = \frac{25}{8}\% \Rightarrow \frac{1}{32}$

$$7\frac{2}{5}\% \Rightarrow \frac{37}{5}\% = \frac{37}{500}$$

$$\begin{array}{ccc} 32 & : & 31 \\ 500 & : & 537 \\ \hline \underbrace{16000 \;\; : \;\; 16647}_{+647} \end{array}$$

$$\therefore \text{Required \%} = \frac{647}{16000} \times 100 = 4.04\% \text{ more}$$

115. (a) $12\frac{1}{2}\% \uparrow = \frac{1}{8}$, $10\% \downarrow = \frac{1}{10}$

$$\begin{array}{lccc} & \text{O} & : & \text{N} \\ \text{Wages} \rightarrow & 8 & : & 9 \\ \text{Hours} \rightarrow & 10 & : & 9 \\ \hline & 80 & : & 81 \end{array}$$

$$\text{Required \%} = \frac{1}{80} \times 100 = 1.25\%$$

116. (c)

$$\begin{array}{lccc} \text{Price} \rightarrow & 5 & : & 4 \\ \text{Sale} \rightarrow & \frac{4}{5} & : & \frac{5}{4} \\ \hline \text{Revenue} \rightarrow & 4 & : & 5 \end{array}$$

$$\text{Sale} \rightarrow \underbrace{16 \quad 25}_{9}$$

$$x = \frac{9}{16} \times 100 = 56.25\%$$

117. (b)

$$\begin{array}{lccc} & \text{A} & : & \text{B} \\ \text{I} \rightarrow & 4x & : & 5x \\ \text{E} \rightarrow & 3y & : & 5y \\ \hline \text{S} \rightarrow & 4x-3y & : & 5x-5y \end{array}$$

$$4x = \frac{9}{10} \times 5y \Rightarrow \frac{x}{y} = \frac{9}{8}$$

$$\text{Saving ratio} = \frac{36-24}{45-40} = \frac{12}{5}$$

$$\therefore \text{Required percentage} = \frac{12-5}{5} \times 100 = 140\%$$

Alternate Method:

Let, B's expenditure = 100

$$\begin{array}{lccccc} & \underline{\text{I}} & : & \underline{\text{S}} & : & \underline{\text{E}} \\ \text{A} \rightarrow & 90 & : & 30 & : & 60 \\ \text{B} \rightarrow & \frac{900}{8} = 112.5 & : & 12.5 & : & 100 \end{array}$$

$$\therefore \text{Required \%} = \frac{17.5}{12.5} \times 100 = 140\%$$

118. (a)

$$\begin{array}{lccc} & \text{A} & : & \text{B} \\ \text{Income} \rightarrow & 5x & : & 4x \\ \text{Expenditure} \rightarrow & 4y & : & 3y \\ \hline \text{Saving} \rightarrow & 5 & : & 6 \\ \hline \end{array}$$

ATQ,

$$\frac{5x-4y}{4x-3y} = \frac{5}{6} \Rightarrow 30x - 24y = 20x - 15y$$

$$\Rightarrow 10x = 9y \Rightarrow \frac{x}{y} = \frac{9}{10}$$

$\therefore$ Expenditure of B = 3 × 10 = 30

$$\text{Required\%} = \frac{6}{30} \times 100 = 20\%$$

119. (a) Let, it depreciate be a% every yrs.

ATQ,

$$40960 \times \left(\frac{100-a}{100}\right)^3 = 21970$$

$$\Rightarrow \left(\frac{100-a}{100}\right)^3 = \frac{2197}{4096}$$

$$\Rightarrow \left(\frac{100-a}{100}\right)^3 = \left(\frac{13}{16}\right)^3$$

$$\Rightarrow \text{\% required} = \frac{3}{16} \times 100 = 18.75\%$$

Alternate Method:

$$\left(\frac{21970}{40960}\right)^{\frac{1}{3}} = \left(\frac{2197}{4096}\right)^{\frac{1}{3}}$$

$$= \left[\left(\frac{13}{16}\right)^{3}\right]^{\frac{1}{3}} = \frac{13}{16} \curvearrowright -3$$

$$\therefore \text{Required\%} = \frac{3}{16} \times 100 = 18.75\%$$

120. (a) Compound annual growth rate

$$= \left(\frac{\text{End value}}{\text{Start value}}\right)^{\frac{1}{\text{No. of years}}} - 1$$

$$= \left(\frac{250000}{100000}\right)^{\frac{1}{5}} - 1 = 1.20 - 1$$

$= 0.20 = 20\%$

121. (a) 70% = 3500
100% = 5000
Actual cost = Rs.5000

122. (c) Price of bike this year

$$= \text{Rs.}1{,}25{,}000 \times \frac{70}{100} = \text{Rs.}87{,}500$$

123. (a) Original price of Car

$$= 500000 \times \frac{100}{80} = \text{Rs.}625000$$

124. (b) Let, number = x
ATQ,

$$x \times \frac{35}{100} \times \frac{20}{100} = 240.8$$

$\Rightarrow x = 3440$
Hence, 18% of number

$$= 3440 \times \frac{18}{100} = 619.20$$

Alternate Method:-

$$x \times 35\% \times \frac{20}{100} = 7\% \text{ of } x$$

7% → 240.8
18% → 619.20

125. (a) Let, population of village = x

$$x \times \frac{21}{20} \times \frac{19}{20} = 47{,}880$$

$\Rightarrow x = 48{,}000$
Hence, population of village = 48,000

Alternate Method:-

$$5\% = \frac{\pm 1}{20}$$

$$\begin{array}{lccc} 1^{\text{st}}\text{ year} \rightarrow & 20 & : & 21 \\ 2^{\text{nd}}\text{ year} \rightarrow & 20 & : & 19 \\ \hline & 400 & : & 399 \\ & \downarrow \times 120 & & \downarrow \times 120 \\ & \boxed{48000} & & 47880 \end{array}$$

Hence, the population at beginning of the first year = 48000

126. (a) $5\% = \frac{1}{20}$

$$\begin{array}{ccc} \text{Present} & : & \text{Increased} \\ 20 & : & 21 \\ 20 & : & 21 \\ \hline 400 & : & 441 \\ \downarrow \times 62 & & \downarrow \times 62 \\ 24800 & & \boxed{27342} \end{array}$$

Note: It can be solved with the help of unit digit.

Alternate Method:
Successive increase of 5% and 5%

$$= \left(5 + 5 + \frac{5 \times 5}{100}\right) = 10.25\%$$

∴ Income in month of feb. 2022

$$= 24800 \times \frac{110.25}{100} = ₹27342$$

127. (d) Let, his sale 2 years ago = x
ATQ,

$$x \times \frac{112}{100} \times \frac{115}{100} = 128800$$

$$\Rightarrow x = \frac{128800 \times 25 \times 20}{28 \times 23} = 100000$$

128. (a) $5\% = \frac{1}{20}$

ATQ,

$$\text{Price after 2 years} = 80{,}000 \times \frac{19}{20} \times \frac{19}{20} = ₹72{,}200$$

129. (c) $20\% = \frac{1}{5}$

ATQ,
Final price of motor cycle

$$= 750 \times \frac{6}{5} = 900\$$$

130. (c) Let population one year ago = x

$$x \times \frac{108}{100} = 142560$$

$\Rightarrow x = 132,\ 000$
Note: 142560 is divisible by 11 so answer is also divisible by 11.

131. (d) Let the present population of the town = x
ATQ,

$$8\% = \frac{8}{100} = \frac{-2}{25}$$

$$9487500 \times \frac{23}{25} \times \frac{23}{25}$$

$x = 8030220$
Hence present population of the town = 8030220

132. (a) Let sale of two years ago = x

$$6\% = \frac{3}{50},\ 20\% = \frac{1}{5}$$

$$x \times \frac{53}{50} \times \frac{6}{5} = 254400$$

$x = 200{,}000$

133. (a) Let the original price of article is x.

$$\Rightarrow x \times \left(\frac{100 + r}{100}\right)\left(\frac{100 - r}{100}\right) = 1$$

$$\therefore x = \frac{10000}{10000 - r^2}$$

Alternate Method:

$$\text{Let, } r = 10\% = \frac{1}{10}$$

$$x \times \frac{11}{10} \times \frac{9}{10} = 1 \Rightarrow x = \frac{100}{99}$$

Go through options,

$$x = \frac{10000}{10000 - r^2} = \frac{10000}{10000 - 100}$$

$$= \frac{10000}{9900} = \frac{100}{99}$$

134. (a) $5\% = \frac{1}{20}$

$$\begin{array}{lccc} & \text{P} & : & \text{A} \\ 1^{\text{st}}\text{ year} \longrightarrow & 20 & : & 21 \\ 2^{\text{nd}}\text{ year} \longrightarrow & 20 & : & 21 \\ \hline & 400 & & 441 \\ & \times 40 \downarrow & & \downarrow \times 40 \\ & 16000 & & \boxed{17640} \end{array}$$

135. (c) $20\% = \frac{1}{5} \curvearrowright^{+} = \frac{6}{5}$,

$$30\% = \frac{3}{10} \curvearrowright^{+} = \frac{13}{10}$$

Now,
ATQ,

$$4{,}00{,}000 \times \frac{6}{5} \times \frac{13}{10} = 6{,}24{,}000$$

Hence, the population of village after 2 years = 6,24,000

136. (c) $4\% = \frac{1}{25}$, $5\% = \frac{1}{20}$

Let the present population of the city is x

$$\therefore x = 175000 \times \frac{26}{25} \times \frac{21}{20} = 191100$$

137. (c) Overall change

$$= +28 - 28 - \frac{28 \times 28}{100}$$

$= -7.84\%$ (decrease)
ATQ,
7.84% of original no = 784

$$\text{original no.} = \frac{784}{7.84} \times 100$$

$= 10000$

138. (b) Population after 3 years

$$= 1024000 \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40} = 1102736$$

139. (b)

$$\begin{array}{ccc} \text{Old} & : & \text{New} \\ 4 & : & 3 \\ 2 & : & 3 \\ 8 & : & 9 \\ \times 850 & & \times 850 \\ \boxed{6800} & & 7650 \end{array}$$

∴ Original price of watch = ₹6800

Alternate Method:
Let, original price of watch = x
ATQ,

$$x \times \frac{3}{4} \times \frac{3}{2} = 7650$$

$\Rightarrow x = 6800$

140. (d)

$$\begin{array}{ccc} \text{Old} & : & \text{New} \\ 10 & : & 9 \\ 10 & : & 11 \\ \hline 100 & : & 99 \\ \downarrow \times 15 & & \downarrow \times 15 \\ 1500 & & 1485 \end{array}$$

∴ Sale on Sunday = ₹1500

141. (c) Let initial year population = x

$$\therefore\ x \times \frac{112}{100} \times \frac{92}{100} = 64400$$

$\Rightarrow x = 62500$

142. (b) Let total initial population be x

ATQ,

$$x \times \frac{80}{100} \times \frac{70}{100} = 12000$$

$\Rightarrow\ x = 21428$

143. (b) Let initial population of village = x

$$x \times \frac{95}{100} \times \frac{80}{100} = 4655$$

$\Rightarrow x = 6125$

144. (b) Annual Birth Rate = 12.7%
Annual Death Rate = 2.7%
Hence, Actual Growth Rate
= 12.7% – 2.7% = 10%

Present	:	Increased
10	:	11
10	:	11
10	:	11
1000	:	1331

diff.

331 unit = 331 × 125 = $\boxed{41375}$

×125

125000

145. (c) No. of toys manufactured in 2019

$$= 25000 \times \frac{120}{100} = 30,000$$

No. of toys manufactured in 2020

$$= 30000 \times \frac{85}{100} = 25,500$$

∴ Total no. of toys
= 25,000 + 30,000 + 25,500
= 80,500

146. (b) Let population at the end of 2020 = x

ATQ,

$$\Rightarrow x \times \frac{108}{100} \times \frac{110}{100} = 47520$$

$\Rightarrow x = 40000$

∴ Population at the end of 2021

$$= 40000 \times \frac{108}{100} = 43200$$

Alternate Method:

Let population at the end of 2021 = x

$$\therefore\ x \times \frac{110}{100} = 47520$$

$\Rightarrow x = 43200$

147. (a) ATQ,
Present population of the small town

$$= 60000 \times \frac{105}{100} \times \frac{90}{100} = 56700$$

148. (b) Population in 2023

$$= 150000 \times \frac{102}{100} \times \frac{102}{100} \times \frac{102}{100}$$

= 159181

149. (b)

Old	:	New
20	:	19
20	:	19
20	:	21
8000	:	7581

ATQ,
7581 unit = 947625

$$8000 \text{ unit} = \frac{947625}{7581} \times 8000$$

= 10,00,000

Alternate Method:
Population of town at the beginning = x

$$\therefore\ x \times \frac{19}{20} \times \frac{19}{20} \times \frac{21}{20} = 947625$$

$\Rightarrow x = 10,00,000$

150. (b) $15\% = \frac{3}{20}$

2012 →	20	:	23
2013 →	20	:	17
2014 →	20	:	23
	8000	:	8993

+993

$$\text{Required }\% = \frac{993}{8000} \times 100$$

= 12.41% increased

151. (b) 10% increment in 3 years = 33.1%
No. of children after three years
= 64000 × 133.1% = 85184

Rate	Equivalent successive percentage increment	
	2 cycle/year	3 cycle/year
5%	10.25%	15.76%
10%	21%	33.10%
15%	32.25%	52.09%
20%	44%	72.80%

152. (c) Strength of school in 2017

$$= 3000 \times \frac{6}{5} \times \frac{4}{5} \times \frac{6}{5} = 3456$$

Increase in strength
= 3456 – 3000 = 456

$$\%\text{ increase} = \frac{456}{3000} \times 100\% = 15.2\%$$

153. (a) A is the population in 2016

$$A \times \frac{53}{50} \times \frac{53}{50} = 50000$$

A = 44499.82 – 44500
B is the population in 2020

$$B = 50000 \times \frac{53}{50} \times \frac{53}{50}$$

B = 56180
Now B – A = 56180 – 44500 = 11680

Alternate Method:-

2016	2018	2020
(A)		(B)
100 →	112.36%	126.24%

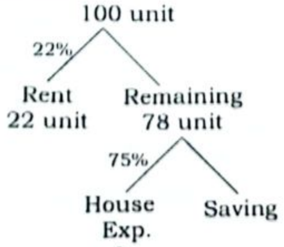
Diff.
26.24%

112.36% = 50000

$$(B - A) = 26.24\% = \frac{50000}{112.36} \times 26.24$$

= 11676.75 ~ 11680

154. (d) Let total income of Ramagya = 100 unit



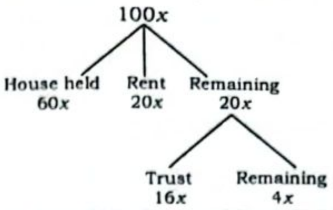
$$78 \times \frac{3}{4} \qquad 78 \times \frac{1}{4}$$

A.T.Q,

$$78 \times \frac{1}{4} \text{ unit} = 3705 \Rightarrow 1 \text{ unit} = 190$$

∴ 100 unit = 19000

155. (b) Let, total salary = 100x

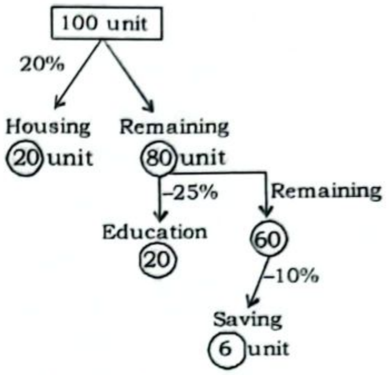


$\because\ 4x = 20000 \ \Rightarrow 100x = 500000$

∴ Total salary = ₹500000

156. (a) (100 – 60 – 10 – 5)% = ₹4000
25% = ₹4000
100% = ₹16000
∴ Monthly salary = ₹16000

157. (d) Let the income of Nazeer = 100 unit



∵ 100 unit → ₹52600
1 unit → ₹526
∴ 6 unit → ₹3,156

Alternate Method:
Saving amount

$$= 52600 \times \frac{8}{10} \times \frac{3}{4} \times \frac{1}{10} = ₹3,156$$

158. (b) Let his monthly income be x.

$$x \times \frac{7}{10} \times \frac{17}{20} \times \frac{13}{20} = 162435$$

$\Rightarrow x = 420000$

Alternate Method:

Rent 30%	→	10	:	7
Food 15%	→	20	:	17
Other 35%	→	20	:	13
		4000	:	1547

1547 units → 162435
1 units → 105
∴ Income = 4000 × 105 = ₹ 420000

159. (b) We know, $25\% = \frac{1}{4}$, $16\% = \frac{4}{25}$

Let the salary of the man = x

$$\text{ATQ, } x \times \frac{3}{4} \times \frac{82}{100} \times \frac{21}{25} = 861$$

$$\Rightarrow x = \frac{861 \times 25 \times 100 \times 4}{3 \times 82 \times 21}$$

$$\Rightarrow x = ₹1666\frac{2}{3}$$

160. (d) Let Father's salary = x.
A.T.Q,

$$x \times \frac{8}{100} \times \frac{85}{100} \times \frac{10}{100} = 17$$

$\Rightarrow x = 2500$

161. (b) A.T.Q.

$45000 \times \frac{110}{100} \times \frac{(100+A)}{100} \times \frac{120}{100}$

$= 83160$

$\Rightarrow 100 + A = 140 \quad \Rightarrow A = 40\%$

Alternate Method:

$45000 \times \frac{11}{10} \times \frac{6}{5} : 83160$

59400 : 83160

$A = \frac{23760}{59400} \times 100 = 40\%$ increase

162. (d) Let total student = 100x

(Girl)

100x → 70x → 49x

(Girl Chosen Soccer)

↓

30x (Boys)

Given that,

So, Total Number of Student

$= \frac{98}{49x} \times 100x = 200$

163. (d) Expenditure = Price × Consumption.

$36\% = \frac{9}{25}$

Old : New

Price → 25 : 34

Consumption → 34 : 25

diff.

9 unit

$\therefore$ Required% $= \frac{9}{34} \times 100\% = 26.5\%$

164. (d)

Old : New

Price → 1 : 4

Consumption → 10 : 3

Expenditure → 5 : 6

Increase in expenditure

$= \frac{6-5}{5} \times 100 = 20\%$

Alternate Method:

Overall change

$= 300 - 70 - \frac{300 \times 70}{100}$

= 230 – 210 = 20% increase

165. (c) $25\% \uparrow = \frac{1}{4}, \ 30\% \downarrow = \frac{3}{10}$

Exp. = Price × Consumption

Old : New

Price → 4 : 5

Consumption → 10 : 7

Expenditure → 40 : 35

diff

5

$\therefore$ % Decrease $= \frac{5}{40} \times 100\% = 12\frac{1}{2}\%$

166. (c)

P → 100 : 123

C → 20×123 : 100×21

E → 100 : 105

20 : 21

C → 123 : 105

$\therefore$ Required % $= \frac{18}{123} \times 100 = 14.6\%$

SMART APPROACH:-

P/C

100 → 123

100 → 105

Diff. = 18

Exp

Required % $= \frac{18}{123} \times 100 = 14.6\%$

167. (c) $\frac{100}{126} = \frac{100 \times x}{115 \times y}$

$\Rightarrow \frac{x}{y} = \frac{115}{126}$

% Decrement $= \frac{126-115}{126} \times 100\%$

= 8.7%

SMART APPROACH:-

P/C

100 → 126

100 → 115

Diff. = 11

Exp

Required % $= \frac{11}{126} \times 100 = 8.7\%$

168. (a)

Initial New

Price → 4 : 3

Consumption → 3 : 4

↓ 60kg

1 unit → 20kg.

169. (c)

Price → 25 : 19

Consumption → 19 : 25

6 unit → 10 kg.

25 unit → $\frac{125}{3}$ kg

Reduced price of rice $= \frac{2500}{\frac{125}{3}}$

$= \frac{2500 \times 3}{125} =$ Rs.60

Alternate Method:

Reduced price of rice $= \frac{2500 \times 24}{100 \times 10}$

= Rs.60

170. (c)

Initial Final

Price → 20 : 17

Consumption → 17 : 20

3 unit = 5kg.

17 unit $= \frac{85}{3}$ kg.

Original price of the washing powder

$= \frac{1275}{85} \times 3 =$ ₹ 45

171. (d)

Original New

Price → 5 : 4

Consumption → 4 : 5

1 unit = 50kg.

4 unit = 200kg.

$\therefore$ Initial price of Rice per kg

$= \frac{450}{200} =$ ₹ 2.25/kg

172. (d)

O : N

Price → 4 : 3

Consumption → 3 : 4

1 unit = 30 kg.

3 unit = 90 kg.

$\therefore$ Original price per kg.

$= \frac{5400}{90} =$ ₹60 per kg.

173. (a)

Initial Final

Price → 10 : 9

Quantity → 9 : 10

1 unit → 22kg.

9 unit → 198kg.

Original Price of rice $= \frac{250}{198} =$ ₹ 1.26

174. (a)

Original New

Price → 20 : 17

Cons. → 17 : 20

3 unit → 2kg

20 unit → $\frac{40}{3}$ kg

Reduced Price of salt per kg

$= \frac{272}{\frac{40}{3}} = \frac{272 \times 3}{40} = 20.4$

175. (a)

Initial Final

Price → 5 : 4

Cons. → 4 : 5

1 unit = 6

5 unit = 30

$\therefore$ Reduced price $= \frac{80}{30} \times 12 =$ ₹ 32

176. (a)

O : N

Price → 25 : 22

Consumption → 22 : 25

3 unit = 7 kg.

22 unit $= \frac{154}{3}$ kg.

$\therefore$ Original price $= \frac{1200 \times 3}{154} =$ ₹ 23.38

177. (a) $40\% = \frac{2}{5}) + \ = \ \frac{7}{5}$ $\begin{matrix} \to \text{Exp.} \\ \to \text{Saving} \end{matrix}$

Now,

Income = Exp. + Saving

12 = 7 + 5

×6,000 ×6,000

72,000 30,000

178. (d) Given, Average expenditure

= ₹21,000

Total expenditure = 2 × 21,000

= ₹42000

Savings = 40% of income

So, expenditure = 60% of income

⇒ 60% of income = 42,000

Income = ₹ 70,000

179. (c)

∵ Income = Expenditure + Savings

100 = 75 + 25

$\xrightarrow{+20\%}$ (+20) $\quad$ (+7.5) $\xrightarrow{+10\%}$ $\quad$ +12.5

120 = 82.5 + 37.5

% Increase in savings

$= \frac{12.5}{25} \times 100 = 50\%$

Alternate Method:

Exp. = 75%, Saving = 25%

E : S = 75 : 25 = 3 : 1

Exp. $\quad$ Savings

10% $\quad$ x%

20% (Income)

3 $\quad$ 1

×10↓ $\quad$ ↓×10

30% $\quad$ 10%

$x = 30\% + 20\% = 50\%$

SMART APPROACH:-

Exp. $\quad$ Saving

3 : 1

$\underbrace{10 : x\%}_{20\%}$

$\therefore x = 20\% + \frac{(20-10)\times 3}{1}$

$= 20\% + 30\% = 50\%$

180. (d)

∵ Income = Expenditure + Savings

300 = 200 + 100

+20% (+60) $\quad$ +30 (+15%) $\quad$ $\boxed{+30\%}$

360 = 230 + 130

Alternate Method:

Exp $\quad$ Saving

15% $\quad$ x%

20% (Income)

2 : 1

×5 $\quad$ ×5

10% $\quad$ 5%

$x = (20 + 10) = 30\%$

SMART APPROACH:-

Exp. $\quad$ Saving

2 : 1

$\underbrace{15 : x\%}_{20\%}$

$\therefore x = 20\% + \frac{(20-15)\times 2}{1}$

$= 20\% + 10\% = 30\%$

181. (a) Income = Expenditure + Saving

300 = 200 + 100

↓+18% $\quad$ ↓+24% $\quad$ 6

354 = 248 + 106

% Change in saving

$= \frac{6}{100} \times 100 = 6\%$

Alternate Method:

Exp. $\quad$ Saving

24%↑ $\quad$ x

Income

18%↑

×6 (12 : 6) ×6

2 : 1

$x = 18 - 12 = 6\%$

SMART APPROACH:-

Exp. $\quad$ Saving

2 : 1

$\underbrace{24 : x\%}_{18\%}$

$\therefore x = 18\% + \frac{(18-24)\times 2}{1}$

$= 18\% - 12\% = 6\%$

182. (d) Income = Exp. + Saving

400 $\quad$ 300 $\quad$ 100

+25% $\quad$ +10%

500 $\quad$ 390 $\quad$ 110

Exp. = 500 − 110 = 390

% increase in exp.

$= \frac{390-300}{300} \times 100\% = 30\%$

Alternate Method:

Exp. $\quad$ Saving

x%↑ $\quad$ 10%↑

25%↑

×5 (15 : 5) ×5

3 : 1

$\therefore x = 25\% + 5\% = 30\%$

SMART APPROACH:-

Exp. $\quad$ Saving

3 $\quad$ 1

$\underbrace{x\%\uparrow \quad 10\%}_{25\%}$

$x = 25\% + \frac{(25-10)\times 1}{3}$

$= 25\% + 5\% = 30\%$

183. (c)

Income : Exp. : Saving

100 : 80 : 20

+15% $\quad$ +5% $\quad$ +11

115 : 84 : 31

% increase in saving

$= \frac{11}{20} \times 100 = 55\%$

Alternate Method:

Exp. $\quad$ Saving

5%↑ $\quad$ x%

Income

15%↑

×10 (40 : 10) ×10

4 : 1

$\therefore x\% = 40 + 15 = 55\%$

% Increase in saving = 55%

SMART APPROACH:-

Exp. : Saving

4 : 1

Increase → $\underbrace{5\% : x\%}_{15\%}$

$x\% = 15 + \frac{(15-5)\times 4}{1}$

$= 15 + 40 = 55\%$

184. (d) Income : Exp. : Saving

100 : 70 : 30

+15% $\quad$ +7.5% $\quad$ ↓

115 : 75.25 : 39.75

% Increase in saving $= \frac{9.75}{30} \times 100$

$= 32.5\%$

Alternate Method:

Exp. $\quad$ Saving

7.5%↑ $\quad$ x%

15%

17.5 : 7.5

×2.5 (7 : 3) ×2.5

$\therefore x\% = 15 + 17.5 = 32.5\%$

185. (a) Income : Exp. : Saving

100 : 75 : 25

+25% $\quad$ +10% $\quad$ ↓+17.5

125 : 82.5 : 42.5

Req. % $= \frac{42.5-25}{25} \times 100$

$= 17.5 \times 4 = 70\%$

Alternate Method:

Exp. $\quad$ Saving

10%↑ $\quad$ x%

25%↑

45% : 15%

×15 (3 : 1) ×15

$\therefore x = 25 + 45 = 70\%$

186. (d) Let the income of Raju = 100 unit

Income = Exp. + Saving

100 = 80 + 20

↓+20% $\quad$ ↓+10% $\quad$ +12

120 $\quad$ 88 $\quad$ 32

∴ % increase in saving

$= \frac{12}{20} \times 100 = 60\%$

Alternate Method:-

Expenditure $\quad$ Saving

10% $\quad$ x%

20%

40 $\quad$ 10

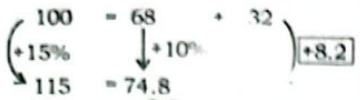
↑×10 $\quad$ ↑×10

4 : 1

$x = 40 + 20 = 60\%$

187. (b)

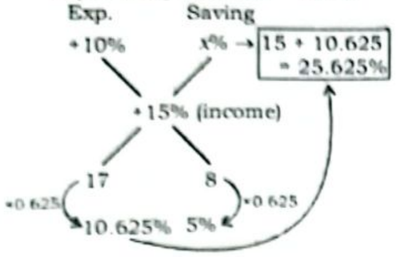
Income = Expenditure + Saving


100 = 68 + 32
+15%
+10%
+8.2
115 = 74.8

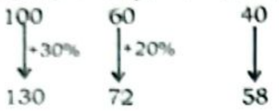
∴ Required% = $\frac{8.2}{32}$ = 25.625%

Alternate Method:

Exp: Saving = 68 : 32 = 17 : 8

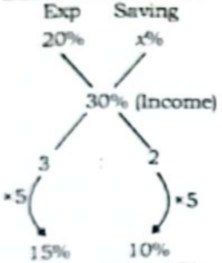

Exp.
Saving
+10%
x% →
15 + 10.625 = 25.625%
+15% (income)
17
8
+0.625
+0.625
10.625%
5%

188. (c) Income = Exp. + Saving


100
60
40
+30%
+20%
130
72
58

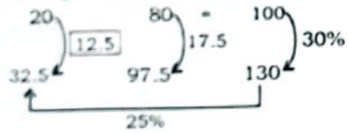
∴ % Increase = $\frac{58-40}{40}$ × 100 = 45%

Alternate Method:


Exp
Saving
20%
x%
30% (Income)
3
2
×5
×5
15%
10%

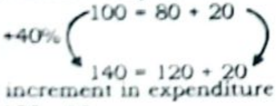
x = 30 + 15% = 45%

189. (b) Saving + Expenditure = Income


20
12.5
80
=
100
17.5
30%
32.5
97.5
130
25%

Req. % = $\frac{12.5}{20}$ × 100 = 62.5%

190. (c) Income = Expenditure + savings


100 = 80 + 20
+40%
140 = 120 + 20

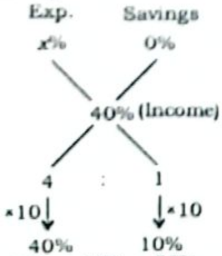
% increment in expenditure

= $\frac{120-80}{80}$ × 100% = 50%

Alternate Method:

Saving = 20% then, Exp = 80%

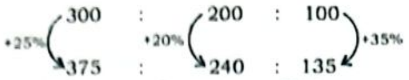
Exp : Saving = 80 : 20 = 4 : 1


Exp.
Savings
x%
0%
40% (Income)
4
:
1
×10
×10
40%
10%

∴ x% = 40% + 10% = 50%

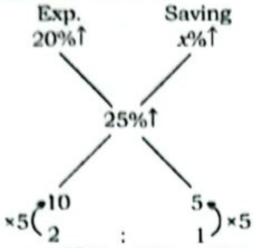
191. (d) $66\frac{2}{3}\% = \frac{2}{3}$

Income : Exp. : Saving


300 : 200 : 100
+25%
+20%
+35%
375 : 240 : 135

% Increase in saving = 35%

Alternate Method:


Exp.
Saving
20%↑
x%↑
25%↑
10
5
×5
×5
2
:
1

∴ x = 25% + 10% = 35%

SMART APPROACH:-

Exp. Saving

2 1

20% x%

25%

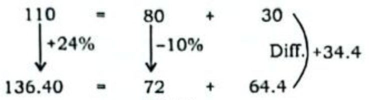
$x = 25\% + \frac{(25-20)\% \times 2}{1}$

= 25% + 10% = 35%

192. (c)

Income = Exp. + Saving

16500 = 12000 + 4500


110 = 80 + 30
+24%
−10%
Diff.
+34.4
136.40 = 72 + 64.4

↑ Saving % = $\frac{34.4}{30}$ × 100 ~ 115%

Alternate Method:

Income = 16500, Exp. = 12000

Saving = 16500 − 12000 = 4500

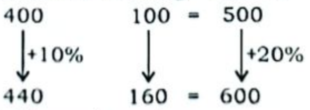
Expenditure : Saving = 8 : 3

Increment in saving =

$24 + \frac{(10+24)\times 8}{3} \sim 115$

193. (c) Let Income = 500

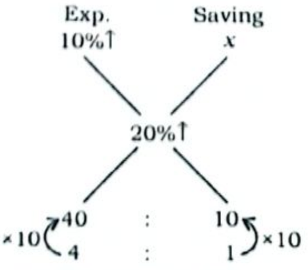
Expenditure + Saving = Income


400
100 = 500
+10%
+20%
440
160 = 600

∴ % Change in saving

= $\frac{60}{100}$ × 100 = 60%

Alternate Method:


Exp.
Saving
10%↑
x
20%↑
40
10
×10
×10
4
:
1

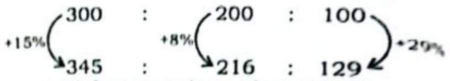
∴ x = (20 + 40)% = 60%

194. (a) Income : Exp.

2021 → 18600 : 12400

3 : 2

Income : Exp. : Saving


300 : 200 : 100
+15%
+8%
+29%
345 : 216 : 129

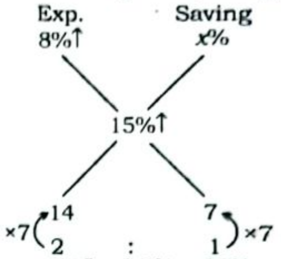
∴ % Increase in saving = 29%

Alternate Method:

Income : Exp.

2021 → 18600 : 12400

3 : 2


Exp.
Saving
8%↑
x%
15%↑
14
7
×7
×7
2
:
1

∴ x = (15 + 14)% = 29%

SMART APPROACH:-

Exp. Saving

2 1

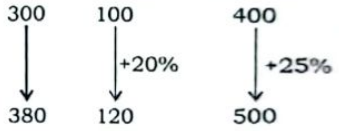
8%↑ x%

15%

$x\% = 15\% + \frac{(15-8)\% \times 2}{1}$

= (15 + 14)% = 29%

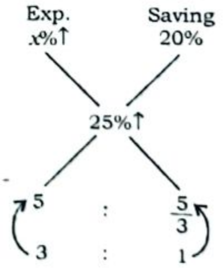
195. (d) Exp. + Saving = Income


300
100
400
+20%
+25%
380
120
500

∴ % increase in expenditure

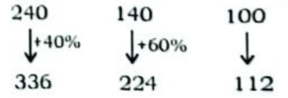
= $\frac{80}{300}$ × 100 = $26\frac{2}{3}$%

Alternate Method:


Exp.
Saving
x%↑
20%
25%↑
5
$\frac{5}{3}$
3
:
1

$x = 25 + \frac{5}{3} = \frac{80}{3} = 26\frac{2}{3}\%$

196. (c) Income = Exp. + Saving


240
140
100
+40%
+60%
336
224
112

12 unit → 2070

1 unit → 172.5

Initial monthly exp. = 172.5 × 140

= ₹24150

197. (b) $26\frac{2}{3}\% = \frac{4}{15}$

Income = Exp. + Saving

150 110 40

↓ +↓20% ↓

150 132 18

18 unit = 4080

150 unit = 34000

198. (d) Income : Exp. : Saving

100 : 72 : 28 (y)

↓+12% ↓+5%

112 : 75.6 : 36.4 (x)

$\therefore \left(\frac{x-y}{y}\times 100\right)\%$

$= \left(\frac{36.4-28}{28}\times 100\right)\%$

$= \left(\frac{8.4}{28}\times 100\right)\% = 30\%$

199. (d)

Income : Exp. : Saving

100 : 55 : 45

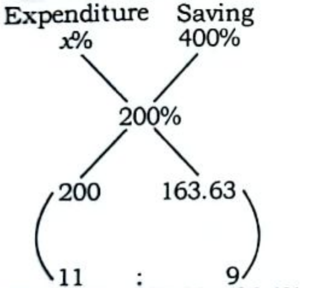
+200% ×5

300 : 75 : 225

% increase in expenditure

$= \frac{75-55}{55}\times 100 = 36.4\%$

Alternate Method:



Expenditure
Saving
x%
400%
200%
200
163.63
11
:
9

x% = 200 – 163.63 = 36.4%

200. (b)

Income = Expenditure + Saving

100 = 80 + 20

+30% +30 +40% +32 –2

130 = 112 + 18

2 unit = 750

$\therefore$ Initial income $= \frac{750}{2}\times 100$

= ₹37500

201. (d)

Income : Expenditure : Saving

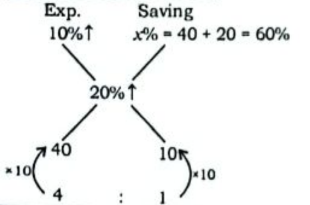
100 : 80 : 20

+20% +10% 12

120 : 88 : 32

% increase in Saving $= \frac{12}{20}\times 100 = 60\%$

Alternate Method:



Exp.
Saving
10%↑
x% = 40 + 20 = 60%
20%↑
40
10
×10
×10
4
:
1

SMART APPROACH:-

Exp. Saving

4 : 1

10 : x%

20%

$\therefore x = 20\% + \frac{(20-10)\times 4}{1}$

= 20% + 40% = 60%

202. (c) ∵ Income = Expenditure + Savings

800 = 500 + 300

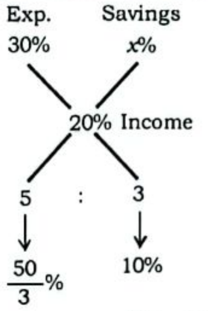
+20% +30%

960 = 650 + 310

%Increase in Savings

$= \frac{10}{300}\times 100 = 3\frac{1}{3}\%$

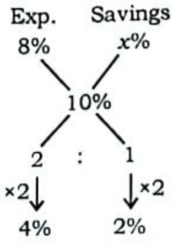
Alternate Method:



Exp.
Savings
30%
x%
20% Income
5
:
3
50/3 %
10%

$x\% = 20 - \frac{50}{3} = \frac{10}{3}\% = 3\frac{1}{3}\%$

203. (b) Ratio of expenditure and savings = 8000 : 4000 = 2 : 1



Exp.
Savings
8%
x%
10%
2
:
1
×2
×2
4%
2%

∴ x% = 10% + 4% = 14%

204. (c)

Income = Expenditure + Saving

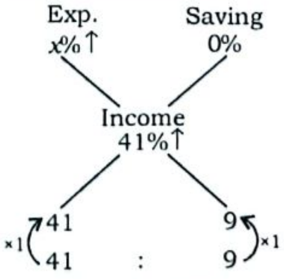
+41% 100 = 82 + 18

141 = 123 + 18

Required % $= \frac{123-82}{82}\times 100$

= 50%

Alternate Method:



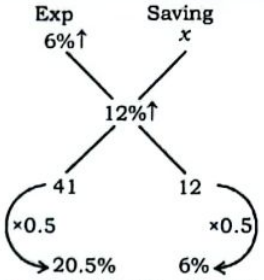
Exp.
Saving
x%↑
0%
Income
41%↑
41
9
×1
×1
41
:
9

∴ x = 41 + 9 = 50%

205. (a) $\begin{bmatrix} \text{Income} & \text{Exp} \\ 26500 : & 20500 \\ 53 : & 41 \end{bmatrix}$

Saving = 53 – 41

= 12



Exp
Saving
6%↑
x
12%↑
41
12
×0.5
×0.5
20.5%
6%

x = (12 + 20.5) = 32.5%

SMART APPROACH:-

Expenditure Savings

41 : 12

Increase/Decrease → 6% x%

12%

$x\% = 12 + \frac{6\times 41}{12}$

= 32.5%

206. (b) Income = Expenditure + Saving

1000 = 650 + 350

+20.1% +20%

1201 = 780 + 421

% increase in saving

$= \frac{421-350}{350}\times 100 = \frac{710}{35} = 20.3\%$

SMART APPROACH:-

Expenditure Savings

13 : 7

Increase/Decrease → 20% x %

20.1%

$x\% = 20.1 + \frac{0.1\times 13}{7}$

= 20.3%

207. (b) I : E : S

100 : 100–x : x

128 : 1.2(100–x) : 1.4x

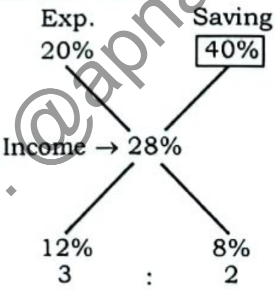
Income = Exp. + Saving

⇒ 128 = 1.2 (100 – x) + 1.4x

⇒ 128 = 120 – 1.2x + 1.4x

⇒ 8 = 0.2x ⇒ x = 40%

Alternate Method:



Exp.
Saving
20%
40%
Income → 28%
12%
8%
3
:
2

∴ Saving (x) $= \frac{2}{2+3}\times 100 = 40\%$

208. (b) Let the income of Manju = 100

Raju + Manju = Total

125 100 225

↓+25% ↓+40% ↓

156.25 140 296.25

% Increase $= \frac{296.25-225}{225}\times100$

$= \frac{71.25}{225}\times100 = 31.67\%$

SMART APPROACH:-

$25\% = \frac{+1}{4}$ $40\% = \frac{+2}{5}$

	RAJU	MANJU	TOTAL
Initially	500	400	900
After Increment	625 = $\left(500\times\frac{5}{4}\right)$	560 = $\left(400\times\frac{7}{5}\right)$	1185

Net Increment $= \frac{285}{900}\times100\% = 31.67\%$

209. (c) Boys : Girls

3 : 4

(Let) 300 400

↓ +10% ↓ +15%

330 : 460

∴ Required ratio $= \frac{330}{460} = \frac{33}{46}$

210. (d) B : G

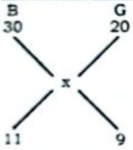
110 90

30% ↓ ↓ 20%

33 18 → Passed

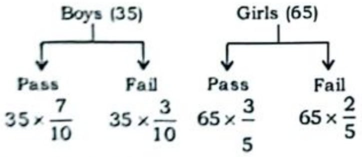
Required % $= \frac{33+18}{110+90}\times100 = 25.5\%$

Alternate Method:


B
30
G
20
x
11
9

$\Rightarrow \frac{30-x}{x-20} = \frac{9}{11} \Rightarrow x = 25.5\%$

211. (b) Let, total number of student = 100
ATQ,

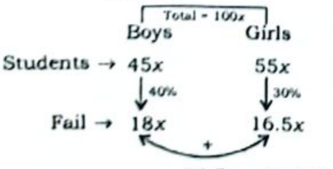

Boys (35)
Girls (65)
Pass
Fail
Pass
Fail
35 × 7/10
35 × 3/10
65 × 3/5
65 × 2/5

Total failed student

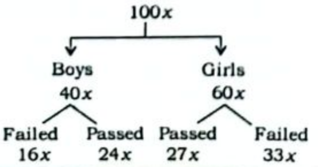
$= \frac{105}{10} + \frac{130}{5} = \frac{365}{10}$

Required% $= \frac{365}{10\times100}\times100 = 36.5\%$

212. (d)


Total = 100x
Boys
Girls
Students →
45x
55x
40%
30%
Fail →
18x
16.5x
+
34.5x → 34.5%

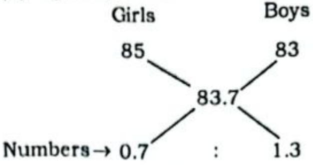
213. (b) Let, total students = 100x.
ATQ,


100x
Boys
40x
Girls
60x
Failed
16x
Passed
24x
Passed
27x
Failed
33x

$\Rightarrow 33x = 66 \Rightarrow x = 2$

$\therefore 24x = 48$

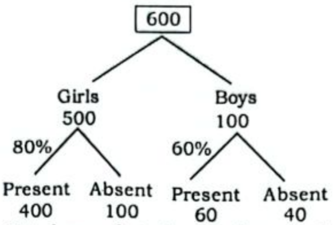
214. (d) By alligation:-


Girls
Boys
85
83
83.7
Numbers→ 0.7
:
1.3

Required% $= \frac{0.7}{2}\times100 = 35\%$

215. (c) $83\frac{1}{3}\% = \frac{5}{6}$

Let, total no. of students = 600


600
Girls
500
Boys
100
80%
60%
Present
400
Absent
100
Present
60
Absent
40

Total no. of students who are absent
= 100 + 40 = 140

∴ Required% $= \frac{140}{600}\times100 = 23\frac{1}{3}\%$

216. (d) Let January's Salary = 100 unit
Total amount spent on groceries and

Clothes $= \frac{18200}{5}\times12 =$ ₹43680

ATQ, 78 unit = ₹43680

⇒ 1 unit = ₹560

⇒ 100 unit = ₹56,000

After 16% hike, February's Salary

$= 56000\times\frac{116}{100} =$ ₹64960

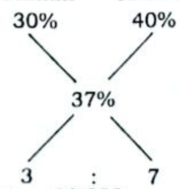
SMART APPROACH:-

February's Salary

$= 18200\times\frac{12}{5}\times\left(\frac{116}{100-22}\right)$

$= 18200\times\frac{12}{5}\times\frac{116}{78} =$ Rs.64960

217. (d)


Suhani
Ritika
30%
40%
37%
3
:
7

3 unit → 90,000

1 unit → 30,000

⇒ y = 7 × 30,000 = ₹ 2,10,000

218. (c) ATQ,

35% = 210 + 14

$100\% = \frac{224}{35}\times100 = 640$

∴ Max. marks of examination = 640

219. (c)

%	Marks
20%	−10
35%	+20

15% = 30 Marks

1% = 2 Marks

Required minimum % marks to p
the examination

$= 20\% + \frac{10}{2}\% = 25\%$

220. (a) A.T.Q.

%	Marks
20%	−30
32%	+42

12% = 72 Marks

1% = 6 Marks

∴ 100% = 600 marks

221. (c)

%	Marks
20%	−25
50%	+20

30% = 45 Marks

20% = 30 Marks

∴ Pass marks = 30 + 25 = 55

222. (a) ATQ,

450 + 35% = 85%

⇒ 50% = 450

$\Rightarrow 35\% = \frac{450}{50}\times35 = 315$

∴ %Increment $= \frac{315}{450}\times100 = 70\%$

Alternate Method:

R Scores → 85% − 35% = 50%

$50\% \times \left(\frac{100+x}{100}\right) = 85\%$

$\Rightarrow 100 + x = 170$

$\Rightarrow x = 70\%$

223. (a) Required %

$= \frac{11628}{1136+7636+11628}\times100$

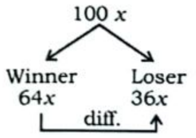
$= \frac{11628}{20400}\times100 = 57\%$

224. (d) (31 − 26)% = 2350

5% = 2350

7% = 3290

225. (a) Let total number of votes polle
= 100 x


100 x
Winner
64x
Loser
36x
diff.

$28x = 434$

$100x = \frac{434}{28}\times100 = 1550$

226.(a) Winner = 88%

∴ Loser = 100 − 88 = 12%

ATQ,

88% − 12% = 76% → 684

$100\% = \frac{684}{76}\times100 = 900$

∴ Total number of votes polled = 90

227. (a) Let total number of votes
= 100 unit

(59 − 41 = 18) unit = 97632

59 unit $= \frac{97632}{18}\times59 = 320016$

228. (d) Total votes = $100x$

A B

$33x$ $67x$

$34x = 55522$ votes

$67x = 109411$ votes

229. (d) Total votes = $100x$

W L

$72x$ $28x$

$44x$

$100x = 1000$ votes

$44x = 440$ votes

230. (a) Let, Total votes = $100x$

$100x$

Winner Loser

$78x$ $22x$

diff.

$56x \rightarrow 448$

$1x \rightarrow 8$

$100x \rightarrow 800$

∴ Total number of voter polled = 800

231. (b) Let,

Total voters = $100x$

Winner Loser

$58x$ $42x$

diff.

$16x \rightarrow 800$

$x \rightarrow 50$

$100x \rightarrow 5000$

∴ Total number of voters = 5000

232. (a) Let total vote $100x$

Winner Loser

$65x$ $35x$

diff.

$30x = 381$

$100x = 1270$ votes

So, Total votes = 1270

233. (b) Let total vote $100x$

Winner Loser

$60x$ $40x$

diff.

$20x = 298$

$100x = 1490$ votes

So, the total votes = 1490

234. (b) Let total vote $100x$

Winner Loser

$56x$ $44x$

diff.

$12x = 1440$

$100x = 12000$ votes

So, the total votes = 12,000

235. (d) Let, the total no. of votes = 100 unit

$100 \xrightarrow{\times 46} \boxed{4600}$

53% 47%

Winner Loser

53 47

diff.

$6 \text{ unit} \longrightarrow 276$

$1 \text{ unit} \longrightarrow 46$

So, the total votes = 4600

236. (b) Let the total vote = 100 unit

Candidate → A B C

Vote% → 40% 35% 25% Total

8 : 7 : 5 = 20 unit

↓×2500 ↓×2500

$\boxed{12500}$ 50,000

237. (a) $100x$= (Polled)

$35x$ $65x$

$30x \rightarrow 15900$

$100x \rightarrow 53000$

238. (b) Let the total votes = $100x$

$100x$ votes

Sanjay Vinod

$47.5x$ $52.5x$

$5x \rightarrow 270$

$$52.5x \rightarrow \frac{270}{5} \times 52.5$$

$= 2835$

239. (b) Let the total number of vote = $100x$

$100x$

W L

$90x$ $10x$

$80x = 800$

$100x = 1000$

240. (c) R = 110% of S

⇒ R : S = 11 : 10

1 unit = 770

∴ Total number of votes

= 770 × 21 = 16170.

Note:- It can be done with the help of unit digit.

241. (a) A.T.Q.

60% of valid votes = 382500

Valid votes = 637500

Invalid votes = 750000 − 637500

= 112500

$$\therefore \text{Required\%} = \frac{112500}{750000} \times 100 = 15\%$$

242. (b) Let, total votes = 100

Total votes → 100

75% ↓

95 → casted votes

A B

75 20

$55 \text{ unit} \xrightarrow{\times 100} 5500$

$100 \text{ unit} \xrightarrow{\times 100} 10000$

The total number of voters in election is 10,000.

243. (d) Total casted vote = 100 − 19 = 81

If A get 27 unit then B get (81 − 27) = 54 unit

B → 54 unit → 125982

$\times\frac{1}{2}$↓ ↓$\times\frac{1}{2}$

A → 27 unit → 62991 vote

244. (b) 12000 (Total votes)

↓90%

10800 (valid votes)

60% 40%

$$\frac{10800 \times 40}{100} = 4320$$

Alternate Method:

Total no. of votes gained by second candidate

$$= 12000 \times \frac{90}{100} \times \frac{(100-60)}{100}$$

$$= 12000 \times \frac{9}{10} \times \frac{4}{10} = 4320$$

245. (d) No. of valid votes that the other candidate got

$$= 8000 \times \frac{85}{100} \times \frac{(100-52)}{100}$$

= 16 × 17 × 12 = 3264

Note: last step calculation should be done with the help of unit digit only option (d) has unit digit 4.

Alternate Method:

Let total votes = $100x$

↓

Valid votes = $85x$

$44.2x$ $40.8x$

$100x = 8000$

$40.8x = 3264$ vote

246. (d) Let total no. of registered votes = $100x$

$100x \rightarrow$ Total votes

↓90%

$90x \rightarrow$ Casted votes

Winner Loser

$54x$ $36x$

$18x = 1242$

$100x = 6900$

Alternate Method:

Let, total no. of registered votes = x

ATQ,

$$x \times \frac{90}{100} \times \frac{20}{100} = 1242$$

$$\Rightarrow x = \frac{1242 \times 100}{18} = 6900$$

247. (d) $20\% \downarrow = \frac{1}{5}$

ATQ,

Votes of other candidate

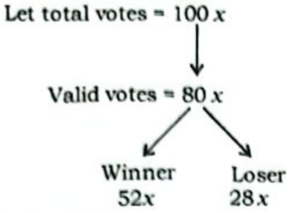
$$= 7500 \times \frac{4}{5} \times \frac{(100-65)}{100}$$

Search On TG: @apria_pdf

$= 7500 \times \frac{4}{5} \times \frac{35}{100} = 2100$

∴ No. of valid votes that other candidate got = 2100

Alternate Method:


Let total votes = 100 x
Valid votes = 80 x
Winner
52x
Loser
28x

$100x = 7500$

$\therefore 28x = 2100$ vote

248. (a) Total no. of valid votes that Arvind got

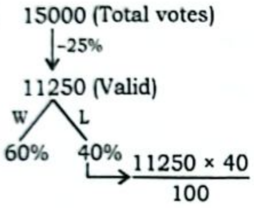
$= 30000 \times \frac{4}{5} \times \frac{(100-55)}{100} = 10800$

249. (b) ATQ,

Votes gets by other candidate

$= 8400 \times \frac{85}{100} \times \frac{40}{100} = 2856$

250. (b)


15000 (Total votes)
-25%
11250 (Valid)
W
L
60%
40%
11250 × 40
100

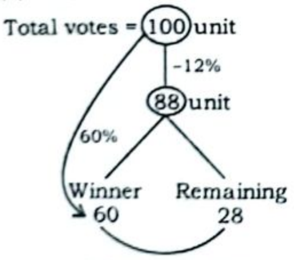
$= 4500$

Alternate Method:-

No. of valid votes for 2nd candidate

$= 15000 \times \frac{75}{100} \times \frac{40}{100} = 4500$

251. (a) Let,


Total votes = 100 unit
-12%
88 unit
60%
Winner
60
Remaining
28

32 unit → 1200

$100 \text{ unit} \rightarrow \frac{1200 \times 100}{32}$

$= 3750$

Alternate Method:

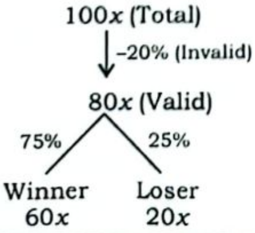
Total votes = votes not cast + winners votes + losers votes

$100\% = 12\% + 60\% + (60\% - 1200)$

$\Rightarrow 32\% = 1200$

$\therefore 100\% = \frac{1200}{32} \times 100 = 3750$

252. (d)


100x (Total)
-20% (Invalid)
80x (Valid)
75%
25%
Winner
60x
Loser
20x

Votes of loser

$= 248000 \times \frac{1}{5} = 49600$

253. (d) Total number of voters enrolled

$= \frac{9504}{80} \times \frac{100}{96} \times \frac{4}{3} \times 100 = 16500$

254. (c) 100x (Total votes)

↓

80x (Casted votes)

↓ –2%

78.4x (Valid votes)

↓ 60%

$47.04x \longrightarrow 9408$

$100x = 20000$

255. (d) Let the total number of people enrolled = x.

ATQ,

$x \times \frac{90}{100} \times \frac{85}{100} \times \frac{60}{100} = 91800$

$\Rightarrow x = \frac{918 \times 1000000}{9 \times 6 \times 85} = 200000$

256. (d) Total votes 300000

↓ 85%

Polled votes = 255000

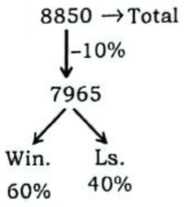
↓ –10%

Valid votes = 229500

Dharam's votes = 137700

$\therefore \text{Required\%} = \frac{137700}{229500} \times 100 = 60\%$

257. (b)

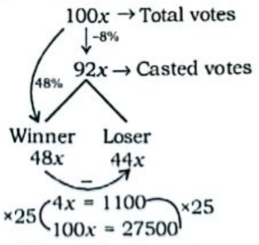

8850 → Total
-10%
7965
Win.
60%
Ls.
40%

No. of valid votes that

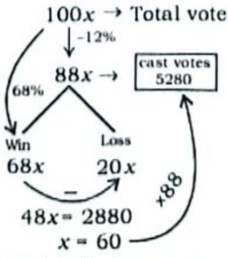
Other candidate got

$= \frac{7965}{5} \times 2 = 3186$

258. (c)


100x → Total votes
-8%
92x → Casted votes
48%
Winner
48x
Loser
44x
–
×25
4x = 1100
100x = 27500
×25

259. (a)


100x → Total votes
-12%
88x →
cast votes
5280
68%
Win
68x
Loss
20x
–
48x = 2880
x = 60
×88

260. (a) Let, total voters = x

ATQ,

$x \times \frac{65}{100} \times \frac{97}{100} \times \frac{65}{100} = 81965$

$\Rightarrow x = 200{,}000$

Alternate Method:

100x (Total votes)

↓ 65%

65x (Casted votes)

↓ –3%

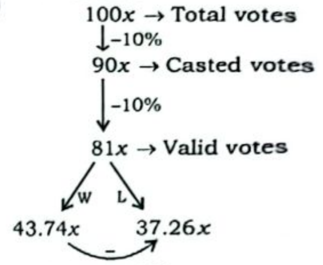
63.05x (Valid votes)

↓ 65%

$40.9825x = 81965$

$100x = 200000$

261. (a)


100x → Total votes
-10%
90x → Casted votes
-10%
81x → Valid votes
W
L
43.74x
37.26x
–

$6.48x = 1620$

$100x = 25000$

Alternate Method:

Let the number of enrolled voters = x

$x \times \frac{9}{10} \times \frac{9}{10} \times \frac{8}{100} = 1620$

$\Rightarrow x = 25000$

262. (d) ATQ,

Votes polled in favour of that candidate

$= 150{,}000 \times \frac{98}{100} \times \frac{3}{5} = 88200$

SMART APPROACH:-

Required no. of votes

$= 1{,}50{,}000 \times \frac{98}{100} \times \frac{3}{5} = 88{,}200$

In the last step, no need of doing complete multiplication. First check the divisibility of 9. In the given options, only option (b) eliminated. Now, check which option is divisible by 7. Only option (d) satisfied.

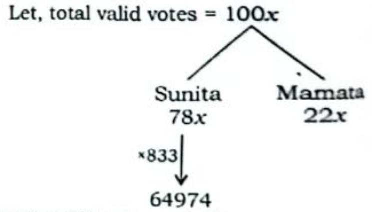
263. (c) Let total enrolled voters = x

ATQ,

$x \times \frac{85}{100} \times \frac{96}{100} \times \frac{85}{100} = 6936$

$\Rightarrow x = 10000$

264. (b)


Let, total valid votes = 100x
Sunita
78x
Mamata
22x
×833
64974

$\therefore$ Total valid votes = $100x$

$= 100 \times 833 = 83300$

$\text{Total votes} = \frac{83300 \times 100 \times 100}{98 \times 85}$

$= 100000$

Alternate Method:

Let, total votes = x

ATQ,

$\left(x \times \frac{85}{100} \times \frac{98}{100}\right) \times \frac{78}{100} = 64974$

$\Rightarrow x = \frac{64974 \times 100 \times 100 \times 100}{85 \times 98 \times 78}$

$= 100000$

265. (b) Total voters × $\frac{80}{100} \times \frac{95}{100} \times \left(\frac{70}{100} - \frac{30}{100}\right) = 36480$

$\therefore$ Total voters = $\frac{36480 \times 100 \times 100 \times 100}{40 \times 80 \times 95}$

= 120000

Note: We can use digital sum method to avoid last step calculation. Digital sum of above fraction is 3 only option (b) has digital sum 3.

266. (a) Let, total number of voters = x

ATQ,

$x \times \frac{80}{100} \times \frac{90}{100} \times \frac{16}{100} = 45360$

$\Rightarrow x = \frac{45360 \times 100 \times 100}{72 \times 16}$

$\Rightarrow x = 393750$

267. (c) Let total number of votes = x

ATQ,

$x \times \frac{80}{100} \times \frac{96}{100} \times \frac{80}{100} = 15360$

$\Rightarrow x = \frac{15360 \times 100 \times 100}{64 \times 96}$

$\Rightarrow x = 25000$

$\therefore$ Total number of votes = 25000

268. (b) Given,

$52.5\% = \frac{21}{40}$

Winner = $\frac{21}{40}$, Loser = $\frac{19}{40}$

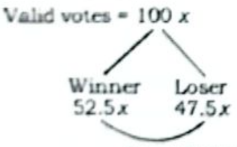
Winner – Loser = $\frac{21}{40} - \frac{19}{40} = \frac{1}{20}$

ATQ,

$x \times \frac{9}{10} \times \frac{19}{20} \times \frac{1}{20} = 1710$

$\Rightarrow x = 40000$

Alternate Method:


Valid votes = 100 x
Winner
52.5x
Loser
47.5x

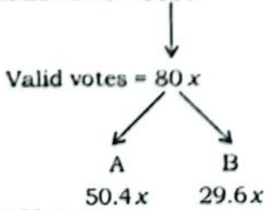
$5x = 1710$ Votes

$100x = 34200$ Votes

Total votes = $34200 \times \frac{10}{9} \times \frac{20}{19}$

= 40000

269. (b) Let total votes = $100\,x$


Valid votes = 80 x
A
B
50.4x
29.6x

$100x = 8750$ votes

$29.6x = 2590$ votes

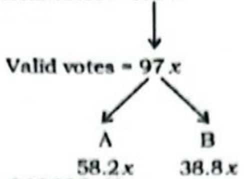
Alternate Method:

ATQ,

votes of B = $8750 \times \frac{4}{5} \times \frac{37}{100}$

= 2590 votes

270. (b) Let total votes = $100\,x$


Valid votes = 97 x
A
B
58.2x
38.8x

$100x = 240000$ Vote

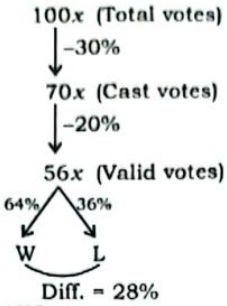
$58.2x = 2400 \times 58.2 = 139680$ Vote

Alternate Method:-

Valid votes in favour of candidate

$= 240000 \times \frac{97}{100} \times \frac{60}{100} = 139680$

271. (b) Let the total number of vote = $100x$


100x (Total votes)
–30%
70x (Cast votes)
–20%
56x (Valid votes)
64%
36%
W
L
Diff. = 28%

ATQ,

$\frac{28}{100} \times 56x = 3136$

$100x = \frac{313600}{1568} \times 100 = 20000$

272. (b) Let, total no. of votes enrolled = x

$x \times \frac{4}{5} \times \frac{19}{20} \times \frac{4}{5} = 9500$

$\Rightarrow x = 15625$

Alternate Method:

$100x$ → Total votes

↓80%

$80x$ → casted votes

↓–5% → invalid votes

$76x$ → valid votes

ATQ, $\frac{80}{100} \times 76x = 9500$

$\Rightarrow 100x = \frac{9500}{80 \times 76} \times 100 \times 100$

= 15625

273. (a) 55% = 42680

100% = 77600

Votes of third candidate

= 10% of 77600 = 7760

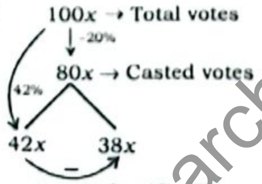
274. (b) Let the total enrolled Voter = x

$\Rightarrow x \times \frac{9}{10} \times \frac{9}{10} \times \frac{56-44}{100} = 1458$

$\Rightarrow x \times \frac{9}{10} \times \frac{9}{10} \times \frac{12}{100} = 1458$

$\Rightarrow x = \frac{1458 \times 100 \times 100}{9 \times 9 \times 12} = 15000$

275. (c)


100x → Total votes
-20%
80x → Casted votes
42%
42x
38x
–

$4x = 112 - 40 = 72$

$100x = 1800$

276. (c) $59.375\% = \frac{59375}{100000} = \frac{19}{32}$

Let, m be the multiplying factor

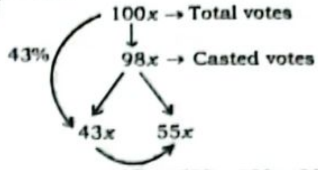
ATQ,

$\left(16000 \times m \times \frac{90}{100}\right) \times \frac{6}{32} = 2484$

$\Rightarrow m = \frac{2484 \times 32 \times 100}{16000 \times 90 \times 6} = \frac{92}{100} \Big) 8$

$\therefore y = 8\%$

277. (a)


100x → Total votes
98x → Casted votes
43%
43x
55x

$12x = 500 - 200 = 300$

$100x = 2500$

Total casted votes = $2500 \times \frac{98}{100}$

= 2450

Alternate Method:

$100\% = 2\% + 500 + 43\% + \underbrace{43\% - 200}_{\text{Loser}}$

$\Rightarrow 100\% = 88\% + 300$

$\Rightarrow 12\% = 300$

$\Rightarrow 100\% = 2500$

$\therefore$ Total casted votes = $2500 \times \frac{98}{100}$

= 2450

278. (c) No. of valid votes that Q got

$= 75{,}60{,}000 \times \frac{17}{20} \times \frac{9}{10} \times \frac{22}{100}$

$= \frac{756 \times 17 \times 9 \times 22}{2} = 1272348$

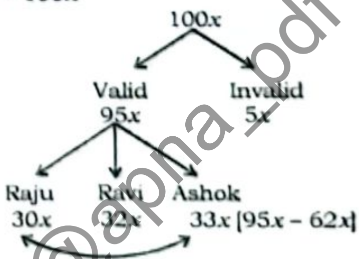
Note: It can be done with the help of unit digit.

279. (a) Total casting vote = 75% = $\frac{3}{4}$

$\Rightarrow 8000 \times \frac{3}{4} = 6000$ vote

$\therefore$ B get = $6000 \times \frac{66}{100} = 3960$

280. (a) Let total number of polled votes = $100x$

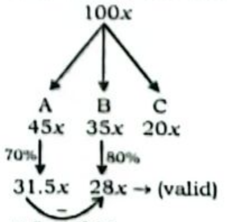

100x
Valid
95x
Invalid
5x
Raju
30x
Ravi
32x
Ashok
33x [95x – 62x]

$3x = 5136$

$x = 1712$

$100x = 171200$

281. (b) Let the total valid votes be $100x$.


100x
A
45x
B
35x
C
20x
70%
80%
31.5x
28x → (valid)
–

$3.5x = 882$

$20x = \frac{882}{3.5} \times 20 = 5040$

282. (d) Total Votes = 100x

100x

A | C | J

35x | $\frac{14}{35}\times 100x = 40x$ | 25x

15x = 4950

100x = 33000

283. (a) Let, y got 100 a votes.

X : Y : Z

130a : 100a : 125a

diff.

5a = 5000

a = 1000

Votes of X, Y and Z = 130a + 100a + 125a = 355a = 355000

Total no. of votes = $\frac{355000}{71}\times 100$

= 500000

Alternate Method:

X : Y : Z

$13_{\times 2}$: $10_{\times 2}$:

$4_{\times 5}$: $5_{\times 5}$

26 : 20 : 25

Total votes = $\frac{\frac{5000}{1}\times 71}{71}\times 100$

= 5,00,000

284. (b) Valid votes = 100x

Winner 65x | Loser 35x

30x = 1200 votes

100x = 4000 votes

Casted votes = 4000 + 200 = 4200

Total number of votes

= $4200\times\frac{100}{70}$ = 6000

Alternate Method:

$\left(x\times\frac{7}{10}-200\right)\times\frac{30}{100}=1200$

$\Rightarrow x = 6000$

285. (b) Valid votes = 100x

Winner 52x | Loser 48x

4x = 98 votes

100x = 2450 votes

Total no. of votes polled

= 2450 + 68 = 2518

Alternate Method:

$(x-68)\times\frac{4}{100}=98$

$\Rightarrow x-68=2450 \Rightarrow x=2518$

286. (b) Total valid votes = 100x

Winner 54x | Loser 46x

8x = 88

100x = 1100

Total number of votes = 1100 + 58

= 1158

287. (d) Let total number of voters = x

ATQ,

$\left(x\times\frac{7}{10}-365500\right)\times\left(\frac{58-42}{100}\right)$

= 2545800

$\Rightarrow\left(\frac{7x}{10}-365500\right)\times\frac{16}{100}=2545800$

$\Rightarrow\left(\frac{7x}{10}-365500\right)=15911250$

$\Rightarrow\left(\frac{7x}{10}\right)=16276750$

$\Rightarrow x = 23252500$

Voters who did not cast their votes

$=23252500\times\frac{30}{100}$

= 6975750 ~ 7 million.

Alternate Method:

Let valid votes = 100 x → $\boxed{15911250}$

Winner 58x | Looser 42x

16x = 2545800

100x = 15911250

Total cast votes

= 15911250 + 365500 = 16276750

Voters who did not cast their votes

$=\frac{16276750}{70}\times 30$

= 6975750 ~ 7million

288. (c) 100 x [Total votes]

↓ −10%

90x (Polled)

Winner 46x | Looser 44x

2x → 410 − 60 (Blank)

2x = 350

x = 175

100x = 17500

289. (d) 100x (total votes)

↓ −12%

88x (cast votes)

↓ −84

88 x − 84 (valid votes)

Ramgya 54x | Shravan 88x − 84 − 54x

20x + 84 = 1456

20x = 1456 − 84 = 1372

$x=\frac{1372}{20}$

$100x=\frac{1372}{20}\times 100=6860$

Alternate Method:

100x (total votes)

↓ −12%

88x (casted votes)

54x | 34x

20x = 1456 − 84 (Blank)

100x = 1372 × 5

= 6860

Note: Whenever we have some data like invalid votes, blank ballot papers, did not cast their votes, etc. in number form do not use this data initially, subtract it after finding the value of difference between the winner and loser. It will save a lot of your valuable time.

290. (d) 100x (total votes)

↓ −10%

90x (casted votes)

50x | 40x

×10 (10x = 170 − 75 = 95) ×10

∴ 100x = 95 × 10 = $\boxed{950}$

291. (a) Let the total vote = 100x

100x (Total votes)

↓ −20%

80x (Casted votes)

45%

W 45x | L 35x

10x = 280 − 80 = 200

100x = 2000

Alternate Method:

100% = 20% + 80 + 45% + $\underbrace{45\% - 280}_{\text{Loser}}$

⇒ 100% = 110% − 200

⇒ 10% = 200 ⇒ 100% = 2000

292. (a) 100x (total votes)

↓ −20x (Invalid)

80x (valid votes)

A 45x | B 35x

10x +

45x : $\frac{18x}{53x}$ (90% of 20x)

So, B would have been won by 8%

293. (a) Let, total no. of votes enrolled = x

$x\times\frac{64}{100}\times\frac{96}{100}\times\frac{64}{100}=12288$

$\Rightarrow x=\frac{12288\times 100\times 100\times 100}{64\times 96\times 64}$

= 31250

Alternate Method:

Total votes 100x

↓ 64%

64x Polled

↓ 4% (Invalid)

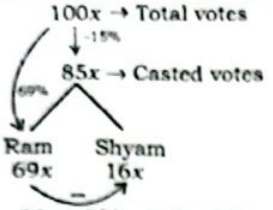
61.44x (valid votes)

$61.44x\times\frac{64}{100}=12288$

$\Rightarrow x=\frac{625}{2}$

$\Rightarrow 100x=\frac{625}{2}\times 100=31250$

294. (b)

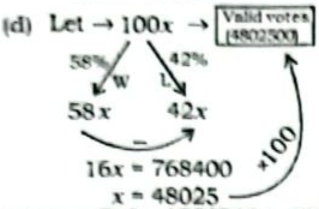


100x → Total votes
-15%
85x → Casted votes
69%
Ram
69x
Shyam
16x
–

$53x = 630 - 100 = 530$

$100x = 1000$

295. (d)



Let → 100x →
Valid votes (4802500)
58%
W
42%
L
58x
42x
–
×100

$16x = 768400$

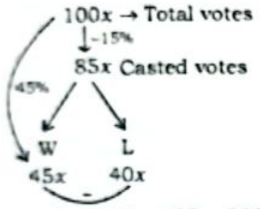
$x = 48025$

Votes polled = 4802500 + 82560 = 4885060

$$\text{Non-casted votes} = \frac{4885060}{80} \times 20 = 1221265$$

$$\text{Required \%} = \frac{82560}{1221265} \times 100 = 6.76\% \sim 6.7\%$$

296. (a)



100x → Total votes
-15%
85x Casted votes
45%
W
45x
L
40x
–

$5x = 400 - 100 = 300$

$100x = 6000$

297 (c) Valid votes $= 40000 \times \frac{90}{100} = 36000$

Abha got = 100 – 36 – 40 = 24%

i.e. $36000 \times \frac{24}{100} = 8640$

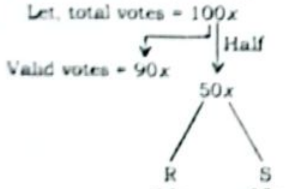
298 (c) Let total number of votes = x

ATQ,

$$\left(x \times \frac{83}{100} \times \frac{96}{100}\right) \times \frac{83}{100} = 156611$$

$\Rightarrow x = 236807.16 \sim 236807$

299 (d)



Let, total votes = 100x
Half
Valid votes = 90x
50x
R
25x
S
25x

Total votes of R

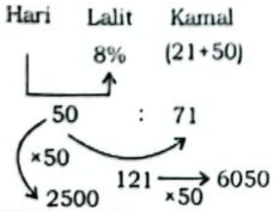
= $25x$ + half of S + half of invalid votes

$= 25x + 12.5x + 5x = 42.5x$

$$\therefore \text{Required \%} = \frac{42.5x}{100x} \times 100 = 42.5\%$$

300. (a) $42\% = \frac{21}{50}$ → Hari+Lalit

ATQ,



Hari
Lalit
Kamal
8%
(21+50)
50
:
71
×50
2500
121
×50
6050

Lalit = 6050 × 8% = 484

∴ Hari = 2500 – 484 = 2016

301. (d) Let,

Bhaskar : Saral : Arjun

100 : 98 : 147

ATQ,

2 Unit = 1296

∴ 1 unit = 648

Half of difference between the votes of Arjun & Bhaskar

$= \frac{1}{2} \times 47 \times 648 = 15228$

302. (b) Let total number of Registered voters = 100

P : Q

Supporters → 70 : 30

60% 30%

Votes → 42 + 9 = 51

Required % = 51%

303. (c) Let total number of (NOTA) votes $= x$

$6x$

Winner : FRU : SRU : NOTA

$2x + 1500 : x + 900 : x + 750 : x$

ATQ,

$2x + 1500 + x + 900 + x + 750 = 6x$

$\Rightarrow 4x + 3150 = 6x \Rightarrow 2x = 3150$

$\Rightarrow x = 1575$

∴ Total number of voters $= 6x + x$

$= 7x$

$= 7 \times 1575 = 11025$

SMART APPROACH:-

Let NOTA get 1 unit vote then candidates get 6 unit votes. Total number of votes will be 7 units. So the answer must be a multiple of 7. Only option (c) multiple of 7.

304. (a) Let, votes Q get = 100, then

P : Q : R

135 : 100 : 115 = 350

A.T.Q,

20 unit = 2412

1 unit $= \frac{2412}{20}$

Total votes polled

$$= \frac{2412}{20} \times 350 \times \frac{100}{90} = 46900$$

SMART APPROACH:-

P Q R

27 : 20 : 23 = 70

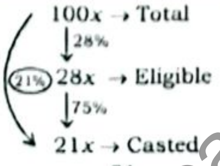
4 unit = 2,412

70 unit = 42210

90% of total votes polled = 42210

voting list $= \frac{42210 \times 10}{9} = 46900$

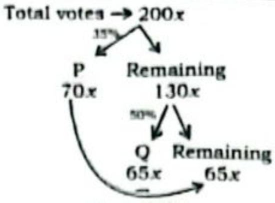
305. (b)



100x → Total
28%
21%
28x → Eligible
75%
21x → Casted

$$\text{Required\%} = \frac{21}{100} \times 100 = 21\%$$

306. (a)



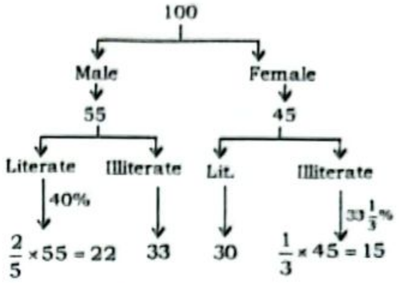
Total votes → 200x
35%
P
70x
Remaining
130x
50%
Q
65x
Remaining
65x
–

$5x = 1000$

$200x = 40000$

307. (a) Let, Total voters = 100

ATQ,

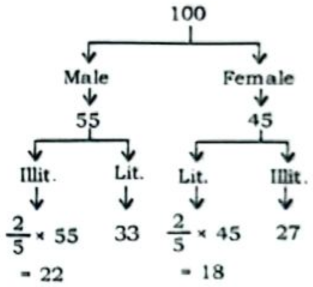


100
Male
55
Female
45
Literate
40%
2/5 × 55 = 22
Illiterate
33
Lit.
30
Illiterate
33 1/3 %
1/3 × 45 = 15

Required% = 30 + 22 = 52%

308. (d) Let total voters be 100

ATQ,



100
Male
55
Female
45
Illit.
2/5 × 55
= 22
Lit.
33
Lit.
2/5 × 45
= 18
Illit.
27

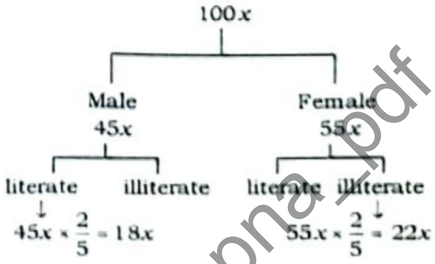
⇒ illiterate female = 27

⇒ illiterate males = 22

Required percentage

$$= \frac{27 - 22}{22} \times 100 = 22.7\%$$

309. (d) Let, total population = 100x.



100x
Male
45x
Female
55x
literate
45x × 2/5 = 18x
illiterate
literate
illiterate
55x × 2/5 = 22x

$$\therefore \text{Required\%} = \left(\frac{22x - 18x}{18x}\right) \times 100 = 22.22\%$$

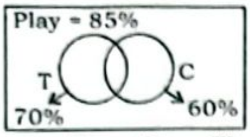
310. (d)

	Paper–A	Paper–B	Paper–C
Full Mark's	100	100	100
Obtained Mark's	75	80	60
Weightage %	40%	50%	10%
Final	30	40	6

Weighted percentage of marks obtained by the candidate, when all the three papers were taken together = (30 + 40 + 6)% = 76%

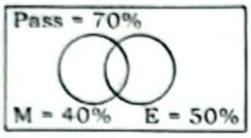
311. (c) Total = 100%

Not play = $60 \times \frac{1}{4} = 15\%$



n(A ∪ B) = n(A) + n(B) − n(A ∩ B)
85% = 70% + 60% − x%
x = 45% ⇒ 45% = 180 ⇒ 1% = 4
Total no. of students
= 100% = 4 × 100 = 400

312. (b) Total = 100%
Fail = 30%



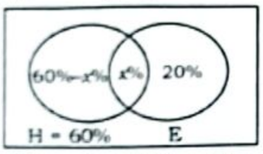
Pass in both subejct = 90 − 70 = 20%
20% = 140 ⇒ 1% = 70
Total no. of students = 100% = 700

Alternate Method:

Total fail = n(M) + n(E) − n (M ∩ E)
= 60% + 50% − 30% = 80%
Then,
Pass = 140
Total no. of students = 100%

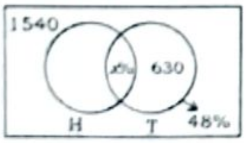
$= \frac{140}{20} \times 100 = 700$

313. (b) No language = x%



60% − x% + 20% + x% + x% = 100%
x = 20%
Who speaks both languge
= 800 × 20% = 160

314. (a) Total = 1750
Not like = x



$1750 \times \frac{48}{100} = 840$
x = 840 − 630 = 210
People who like = 1750 − 210 = 1540
Only likes hindu = 1540 − 840 = 700

So, in% = $\frac{700}{1750} \times 100 = 40\%$

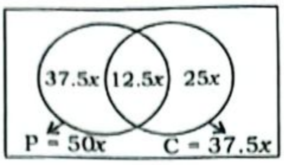
Alternate Method:

Direct By %
Given, Total people = 1750
People who like times of india = 48%
People who like only times of india

$= \frac{630}{1750} \times 100 = 36\%$

Like both newspaper = 48% − 36%
= 12%
Then, Not like = 12%
Total people who like = 100 − 12 = 88%
People who likes only the Hindu
= 88% − 48% = 40%

315. (b)



Total pass = 50 + 37.5 − 12.5 = 75x
Total fail = 100x − 75x = 25x
Girls = 25x Boys = 75x

$25x \times \frac{25}{100} = 20$ $= 75 \times \frac{16}{5} = 240$

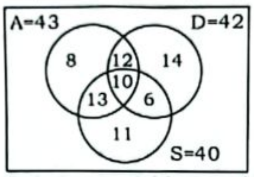
$x = \frac{80}{25} = \frac{16}{5}$

Total fail = $25 \times \frac{16}{5} = 80$

Fail boys = 80 − 20 = 60

Boys fail (in %) = $\frac{60}{240} \times 100 = 25\%$

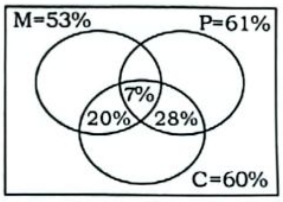
316. (a) Triple Ven Diagram formula
n(A ∪ B ∪ C) = n(A) + n(B) + n(C) − n(A ∩ B) − n(B ∩ C) − n(A ∩ C) + n(A ∩ B ∩ C)



Only in two subjects = 31
Only in one subject = 33

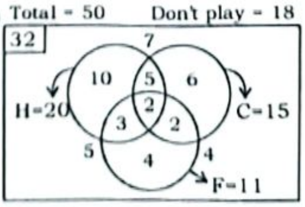
Required % = $\frac{31}{33} \times 100 = 93.99\%$

317. (b)



Not passed students = 5%
Then, passed students = 95%
n(A ∪ B ∪ C) = n(A) + n(B) + n(C) − n(A ∩ B) − n(B ∩ C) − n(A ∩ C) + n(A ∩ B ∩ C)
95% = 53% + 61% + 60% − 24% − 35% − 27% + K
95% = 88% + K
K = 95% − 88% = 7%
Passed in mathematics and chemistry but not in physics = 20%
Passes in physics and chemistry but not in maths = 28%
Required ratio = 20 : 28 = 5 : 7

318. (c) Total = 50 Don't play = 18



n(A ∪ B ∪ C) = n(A) + n(B) + n(C) − n(A ∩ B) − n(B ∩ C) − n(A ∩ C) + n(A ∩ B ∩ C)
32 = 20 + 15 + 11 − 5 − 4 − 7 + K
32 = 30 + K
K = 2
So,
2 : 10
1 : 5

319. (a) Let, Total sale be = x
Commission of agent

$= 10{,}000 \times \frac{5}{100} + (x - 10000) \times$

$= 500 + \frac{4x}{100} - 400 = 100 + \frac{4x}{100}$

$x - \left(100 + \frac{4x}{100}\right) = 28700$

ATQ,

$x - \frac{4x}{100} = 28800$

$\frac{96x}{100} = 28800$

$x = 30{,}000$

Alternate Method:

$\frac{10{,}000}{4\%} + \frac{10{,}000}{4\%}$

1% → add in company's profit

$10{,}000 \times \frac{1}{100} = 100$

If comany gives 4% commission fr starting then ₹100 more invest.
Then,
28700 + 100 = 28800
∴ 96% = 28800
Total sales = 100%

$= \frac{28800}{96} \times 100\% = 30{,}000$

320. (c) $\frac{15000}{12\%} + \frac{15000}{13\%} \Rightarrow \underline{\frac{+1\%}{13\%}}$

(We equate both percent)
Now,

$15000 \times \frac{1}{100} = 150$

7650 + 150 = 7800
13% = 7800

Total sales = 100% = $\frac{7800}{13} \times 100$
= 60,000

321. (a) Total sale = 100x

Case - I Case - II
$\frac{7\%}{}$ $\frac{10000 + 10000}{0\% \quad 4\%}$
$\underbrace{0\% \quad 4\%}_{3000}$

$= 3000 + (100x - 10000) \times \frac{4}{100}$

$= 3000 + 4x - 400$
$= 4x + 2600$
$3x = 1800$
$x = 600$
$100x = 60{,}000$

Alternate Method:

Case - I Case - II
$\frac{7\%}{}$ $\frac{10000 + 10000}{4\% \quad 4\%}$ (Equate both%)
↓
2600 − 800
= 1800
$\underbrace{10000 \times \frac{4}{100} = 400}_{3000 - 400 = 2600}$

7% − 4% = 3% = 1800

Total sales = 100% = $\frac{1800}{3} \times 100$
= 60,000

322. (d)

Case-I — Case II

$\frac{7\%}{}$ — $\underbrace{\frac{12000}{0\%} : \frac{12000}{7\%}}_{4700}$

$\frac{13\%}{}\downarrow$ — $\frac{12000}{7\%} : \frac{12000}{7\%}$ (We equate both%)

$\underbrace{12000 \times \frac{7}{100} = 840}_{4700 - 840 = 3860}$

$3860 - 620 = 3240$

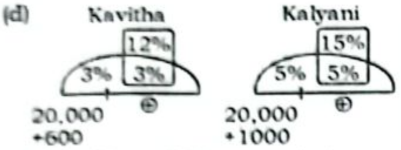
$13\% - 7\% = 6\%$

$6\% = 3240$

$$100\% = \frac{3240}{6} \times 100 = 54000$$

323. (a) Total sales = 5,68,000
Total comission = 2% of 2,00,000 + 1.5% of 2,00,000 + 1% of 1,68,000
= 4000 + 3000 + 1680
= ₹8680

324. (d)



If we get 3% and 5% commission on total sales by Kavitha and Kalyani
Then, Difference = 7600 + 400
5% = 7600 + 400
5% = 8000
100% = 1,60,000
Kavitha (Total commission)
= 15% of 160000 − 600
= 24000 − 600
= ₹23400

325. (a) $\frac{3000}{a\%} + \frac{4000}{b\%} = 960$

$30a + 40b = 960$

$\frac{3000}{a\%} + \frac{5000}{b\%} = 1110$

$30a + 50b = 1110$

Now,

$30a + 40b = 960$
$30a + 50b = 1110$

$10b = 150$
$b = 15\%$
$30a + 40 \times 15 = 960$
$30a = 360$
$a = 12\%$

326. (d) Increase in tax amount = Decrease in Amount of net income
Tax × x% = N.I × y%
Tax × 27% = N.I × 3%

$\frac{\text{Tax}}{\text{N.I}} = \frac{1}{9}$

Actual income = 10

Rate of income tax = $\frac{1}{10} \times 100 = 10\%$

327. (a) Tax × x% = N.I × y%
Tax × 12% = N.I × 3%

$\frac{\text{Tax}}{\text{N.I}} = \frac{1}{4}$

Acutal income = 1 + 4 = 5

Old rate = $\frac{1}{5} \times 100 = 20\%$

New Rate = $20 \times \frac{112}{100} = 22.4\%$

328. (a) Tax free part of our income always tax free
let, 29.95% = 30% (For for easy calculation)

$\text{Tax}_1 = \text{Tax}_2$

$x \times 70\% \times 18\% = (x + 1800) \times 70\% \times 15\%$

$6x = 5x + 9000$

$x = 9000$ (Initial income)

329. (b) I case ⇒ Tax free part of income = 20%
II case ⇒ Tax free part of income = 30%

Tax_1 — Tax_2

$x \times 80\% \times 14\% = (x + 2000) \times 70\% \times 12\%$

$4x = 3x + 6000$

$x = 6000$ (Initial income)

Current income = 6000 + 2000 = 8000

330. (b) Tax free part in both case = 27%

Tax_1 — Tax_2

$28{,}800 \times 73\% \times 12\% = (28{,}800 + x) \times 73\% \times 10\%$

$34560 = 28{,}8000 + x$

$x = 5760$ (Increase income)

331. (a) Tax free part in both case = 29%

$$\frac{x \times 71\% \times 15\%}{(x - 3000) \times 71\% \times 18\%} = \frac{3}{2}$$

$\frac{x}{x - 3000} = \frac{9}{5}$ (We check multiple of 9 in all options)

$5x = 9x - 27000$

$4x = 27000$

$x = 6750$ (Initial income)

332. (a) Let D = 100

$$A = 100\left(\frac{120}{100}\right)\left(\frac{60}{100}\right)\left(\frac{125}{100}\right) = 90$$

$$\text{Required \%} = \left(\frac{100 - 90}{100}\right) \times 100 = 10\%$$

Alternate Method:

A B C D
90 : 72 : 120 : 100

$100 \xrightarrow{-10} 90$

$$\text{Required \%} = \frac{10}{100} \times 100 = 10\%$$

333. (c) $25\% \uparrow = \frac{1}{4}$, $30\% \downarrow = \frac{3}{10}$,

$20\% \uparrow = \frac{1}{5}$

A : B = 5 : 4
B : C = 7 : 10
C : D = 6 : 5
A : D = 42 : 40

$\text{Req.\%} = \frac{2}{40} \times 100 = 5\%$

334. (c) Let the two no. be x & y
⇒ x + y = 450
ATQ,

$$\frac{x \times 96}{100} = \frac{y \times 120}{100} \Rightarrow \frac{x}{y} = \frac{10}{8} = \frac{5}{4}$$

∵ (5 + 4) = 9 units = 450 $\xrightarrow{\times 50}$
4 units = $\boxed{200}$ $\xrightarrow{\times 50}$

335. (c) Let, D = 100

A : B : C : D
90 : 72 : 120 : 100

$100 \xrightarrow{10} 90$

$$\text{Required \%} = \frac{10}{100} \times 100 = 10\%$$

336. (d) $15\% \uparrow\downarrow = \frac{3}{20}$

Let number = x

$x \times \frac{23}{20} \times \frac{17}{20} = 782 \Rightarrow x = 800$

Now,
Resultant Number

$$= \frac{800 \times 3 \times 5 \times 4}{4 \times 4 \times 5} = 600$$

337. (a) Let numbers are A and B
ATQ,
100% B − 20% A = 70% B
⇒ 30% B = 20% A

$\Rightarrow \frac{A}{B} = \frac{3}{2} = 3 : 2$

338. (c) Let bigger no. A and smaller no. B
A + B = 680

$\frac{17}{20}A = \frac{23}{20}B$

$\Rightarrow \frac{A}{B} = \frac{23}{17}$

∴ 40 unit → 680
17 unit → 289

339. (a) C = 8000
B = 8000 × 60% = 4800

$A = 4800 \times \frac{130}{100} = 6240$

So, Avg. of total Amount

$$= \frac{8000 + 4800 + 6240}{3}$$

$$= \frac{19040}{3} = 6346.66 \approx 6347$$

Alternate Method:

Let, investment of C = 100x

C : B : A
100x : 60x : 78x

$$\text{Avg. of A, B, C} = \frac{100x + 60x + 78x}{3}$$

$= \frac{238x}{3}$

100x = 8000

$\frac{238x}{3} = 6346.66 = 6347$

340. (a) $137.5\% \uparrow = \frac{11}{8}$

A : B : C
133 : 190 : 80 (Let)

$190 \xrightarrow{-30\%} 133$, $80 \xrightarrow{+137.5\%} 190$, $80 \xrightarrow{\times 500}$ $\boxed{\text{Rs.}40000}$

57 unit $\xrightarrow{\times 500}$ 28500

341. (c) $10\frac{2}{3}\% = \frac{8}{75}$ and $33\frac{1}{3}\% = \frac{1}{3}$

$$\begin{array}{ccccc} B & : & A & : & C \\ 75 & : & 83 & : & 83 \\ 2 & : & 2 & : & 3 \\ \hline 150 & : & 166 & : & 249 \end{array}$$

Sum of A, B and C = 3 × 4520
= 13560

(150 + 166 + 249) unit = 13560

565 unit = 13560

$\therefore$ Share of B $= \frac{13560}{565} \times 150 = 3600$

342. (d) $80\% = {+}\frac{4}{5}$

ATQ,

A : B = 9 : 5

$C = (A + B)$ of $51\frac{3}{7}\%$

$C : (A + B) = \frac{360}{7} : 100 = 36 : 70$

$A : B : C = \underbrace{45 : 25 : 36}_{\text{diff. } 9}$

Required % $= \frac{9}{45} \times 100 = 20\%$

343. (d) Let the original number 100 then

$$\begin{tikzcd} \text{1st} & \text{2nd} & \text{3nd no.} \\ 100\ (\text{let}) \arrow[r, bend right, "20\%\downarrow"'] & 80 \arrow[r, bend right, "200\%\uparrow"'] & 240 \end{tikzcd}$$

difference between 3rd and 1st no.

= 240 − 100 = 140

Diff b/w 3rd & 2nd no

= 240 − 80 = 160

$\therefore$ Required% $= \frac{20}{160} \times 100$

= 12.5% Less

344. (d) Given that

$\frac{11}{5}A = \frac{22}{100}B \Rightarrow A = \frac{B}{10}$

Also, $B = \frac{2.5}{100}C$; $C = 5500$

$\Rightarrow B = \frac{25}{1000} \times 5500 = 137.5$

$\Rightarrow A = \frac{B}{10} = 13.75$

Required sum

$= \left(\frac{80}{100} \times 13.75\right) + \left(\frac{40}{100} \times 137.5\right)$

= 11 + 55 = 66

345. (b) If B got x marks

A got = $(x + 25)$ marks

ATQ,

$(x + 25) = (x + x + 25) \times \frac{60}{100}$

$\Rightarrow 5x + 125 = 6x + 75$

$\Rightarrow x = 50$

$\therefore B = 50, A = 75$

Alternate Method:

$60\% = \frac{3 \rightarrow A}{5 \rightarrow A+B}$

$A : B = 3 \curvearrowright 2$

1 unit → 25

$A = 3 \times 25 = 75 \Rightarrow B = 2 \times 25 = 50$

346. (a) $70\% \uparrow = \frac{7}{10}$, $30\% \downarrow = \frac{3}{10}$

$$\begin{array}{ccccc} R & : & SH & : & S \\ 17 & : & 10 & : & 10 \\ 7 & : & 7 & : & 10 \\ \hline 119 & : & 70 & : & 100 \end{array}$$

$\Rightarrow R : S = 119 : 100$

347. (a) Total consumption of oil $= \frac{3045}{15}$
= 203 lt.

$\therefore$ Increase in monthly expenditure

$= 203 \times 82 \times \frac{1}{20} = 832.3 \sim ₹\,832$

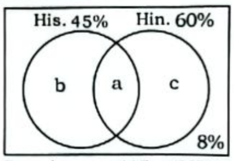
348. (c) Total failed

= n(His.) + n(Hin.) −n(His. ∩ Hin.)

= 55% + 40% − 8% = 87%

$\therefore$ Pass% = 100% − 87% = 13%

Alternate Method:



2a + b + c = (45 + 60)% = 105% (given)

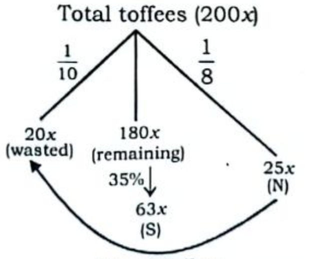
a + b + c = (100 − 8)% = 92%

$\Rightarrow$ a = 13%

349. (a) $\frac{1}{10}$, $35\% = \frac{7}{20}$, $\frac{1}{8}$

LCM (10, 20, 8) = 200

Let Total toffees = $200x$



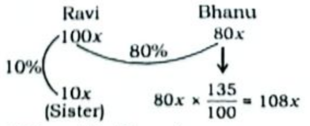
$5x = 10$ Toffees

$63x = 126$ Toffees

$\therefore$ Number of Toffees given to S = 126

SMART APPROACH:-
From the second line of the question, 35% of the remaining toffees are given to S. This means the number of toffees that S will receive must be a multiple of 7. Among the given options, only (a) is a multiple of 7.

350. (c) Let, Ravi has $100x$ chocolates

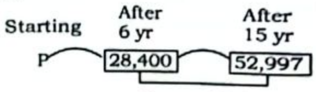


$\because 108x = 54$ (Given)

No. of chocolates that his sister has

$(10x) = \frac{54}{108} \times 10 = 5$

351. (c)



9 yr → 24,597

1 yr → $\frac{24,597}{9}$

= Rs.2733

352. (c) Total number of females in the new group $= 250 \times \frac{60}{100} + 30 = 180$

Required % $= \frac{180}{280} \times 100 = 64.29\%$

353. (c) Let, increment I time be x.

ATQ,

Overall increment $= \frac{1295}{1000} \times 100$
= 129.5%

Then,

$x + 2x + \frac{2x^2}{100} = 129.5$

$\Rightarrow 2x^2 + 300x - 12950 = 0$

$\Rightarrow x^2 + 150x - 6475 = 0$

$\Rightarrow x^2 + 185x - 35x - 6475 = 0$

$\Rightarrow x = 35\%$

$\therefore$ Second increment = 70%

Alternate Method:

Overall increment $= \frac{1295}{1000} \times 100$
= 129.5%

From options: Let us start with a multiple of '2'

(c) $35 + 70 + \frac{35 \times 70}{100} = 105 + 24.5$

= 129.5%

$\therefore$ II increment = 70%

354. (a) $20\% = \frac{1}{5}$

Let initial price be 100

$$\begin{tikzcd} \text{Price} \arrow[r] & 100 \arrow[r, "+20\%"] & \overset{\text{I}}{120} \arrow[r, "+20\%"] & \overset{\text{II}}{144} \arrow[d, "+20\%"'] \\ & & \overset{\text{IV}}{207.36} & \overset{\text{III}}{172.8} \arrow[l, "+20\%"] \end{tikzcd}$$

ATQ,

(207.36 − 172 .8 = 34.56) unit = 324

144 unit $= \frac{324}{34.56} \times 144 = ₹1350$

355. (b) Cost of chairs that he purchased

$= 4500 \times \frac{4}{5} \times \frac{11}{10} = 90 \times 44 = ₹3960$

356. (d) Let the population 3 years ago = x

ATQ,

$20\% = \frac{1}{5}{+} = \frac{6}{5}$

$\Rightarrow x \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} = 80{,}00{,}000$

$\Rightarrow x = 46{,}29{,}629.63$

Now, population after one year

$\Rightarrow x \times \frac{6}{5} = 46{,}29{,}629.63 \times \frac{6}{5}$

= 55,55,555.56

Diff. = 55,55,555.56 − 46,29,629.63

= 925925.925

SMART APPROACH:-

Diff. between population
3 years ago and 2 years ago

$= 80,00,000 \times \left[\frac{25}{36} - \frac{125}{216}\right]$

$= 80,00,000 \times \frac{25}{216}$

$= 925925.925$

357. (a) Let, initial price = x
ATQ,
$x \times \frac{9}{10} \times \frac{23}{25} = 12420$
$\Rightarrow x = 15000$
Price after 10% down
$= 15000 \times \frac{9}{10} = 13500$
So he could have saved
$= 13500 - 12420 = 1080$

358. (a) Let, initially man had = x
$x \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = 100 \Rightarrow x = 6400$

359. (a) Equivalent increment
$= 60 + 30 + \frac{60 \times 30}{100} = 108\%$

Income : Exp. : Saving
100 : 60 : 40
↓108% : ↓ : ↓250%
208 : 68 : 140

$\therefore$ Required% $= \frac{68}{208} \times 100 = 32.7\%$

360. (c) A = 12500 − 10625 = 1875
$X = \frac{1875}{12500} \times 100 = 15\%$
B = 34000 − 30600 = 3400
$Y = \frac{3400}{34000} \times 100 = 10\%$
$\therefore X : Y = 15 : 10 = 3 : 2$

361. (c) ATQ,

I : F
RM → 100 : 125
LC → 30 : 47.5
Total → 130 : 172.5

% decrease in consumption
$= \frac{172.5 - 130}{172.5} \times 100 = 24.6\%$

Alternate Method:
(Cost of Raw Material + labour Cost)
= Price of object
Let price of Raw material = 100
$\therefore$ Exp → $(100 + 30) \times x = (125 + 47.5) \times y$
$\Rightarrow \frac{x}{y} = \frac{172.5}{130}$
$\therefore$ % Decrease in Consumption
$= \frac{42.5}{172.5} \times 100 = 24.6\%$

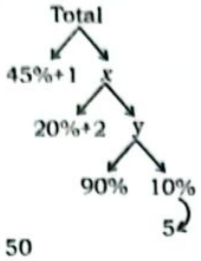
362. (d)

A : B : C
Number → 20 : 30 : 40
Working% → 20 : 30 : 40
4 : 9 : 16

$\therefore$ Working percentage
$= \frac{29}{90} \times 100 = 32\%$ (approx)

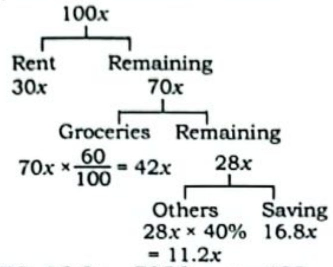
363. (b) $x \times \left(\frac{16}{10} \times \frac{1}{2}\right) \times \left(\frac{16}{10} \times \frac{1}{2}\right) \times \left(\frac{16}{10} \times \frac{1}{2}\right)$
$= 15360$
$\Rightarrow x \times \frac{8 \times 8 \times 8}{1000} = 15360$
$\Rightarrow x = \frac{15360}{512} \times 1000$
$\Rightarrow x = 30,000$

364. (b)


Total
45%+1
x
20%+2
y
90%
10%
5

y = 50
$x = \frac{52}{80} \times 100 = 65$
$\therefore$ Total $= \frac{66}{55} \times 100 = 120$

365. (c) Let total income = $100x$

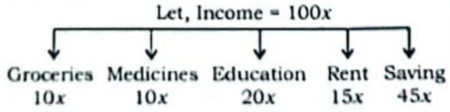

100x
Rent
30x
Remaining
70x
Groceries
70x × 60/100 = 42x
Remaining
28x
Others
28x × 40%
= 11.2x
Saving
16.8x

ATQ, $16.8x = 7056 \Rightarrow x = 420$
Spend on groceries = $42x$
$= 420 \times 42 = 17640$

Alternate Method:
Let total income is x.
ATQ,
$x \times \frac{7}{10} \times \frac{2}{5} \times \frac{3}{5} = 7,056$
$\Rightarrow x = 42,000$
Now, His expenditure on groceries
$= 42,000 \times \frac{7}{10} \times \frac{3}{5} = 17,640$

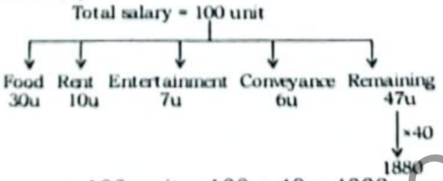
Note:- It can be done with the help of unit digit.

366. (b)


Let, Income = 100x
Groceries
10x
Medicines
10x
Education
20x
Rent
15x
Saving
45x

$\therefore$ Saving $= 30000 \times \frac{45}{100} = 13,500$

367. (a)


Total salary = 100 unit
Food
30u
Rent
10u
Entertainment
7u
Conveyance
6u
Remaining
47u
×40
1880

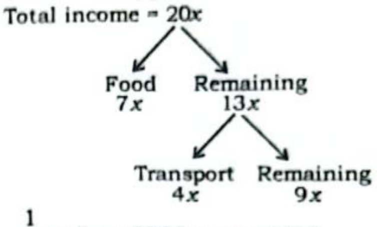
$\therefore$ 100 unit = 100 × 40 = 4000

368. (c) Let total salary = x
ATQ,
$x \times \frac{17}{20} \times \frac{3}{4} \times \frac{3}{4} \times \frac{17}{20} = 10404$
$\Rightarrow x = 10404 \times \frac{20 \times 4 \times 4 \times 20}{17 \times 3 \times 3 \times 17} = 25600$

Alternate Method:
By digital sum method,
$x = 10404 \times \frac{20 \times 4 \times 4 \times 20}{17 \times 3 \times 3 \times 17}$
$= \frac{1156 \times 16 \times 400}{289}$
Digital sum = 4 × 7 × 4 = 4
Digital sum of 25600 = 4

369. (a) Let initially Pranav has = Rs.x
ATQ,
$x \times \frac{70}{100} \times \frac{14}{100} \times \frac{1}{2} = 98000$
$\Rightarrow x =$ Rs.2000000

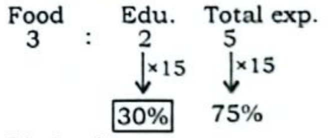
370. (c) $35\% = \frac{7}{20}$, $20\% = \frac{1}{5}$


Total income = 20x
Food
7x
Remaining
13x
Transport
4x
Remaining
9x

$\frac{1}{5} \times 9x = 6300 \Rightarrow x = 3500$
Total income = $20x = 20 \times 3500$
= Rs.70000

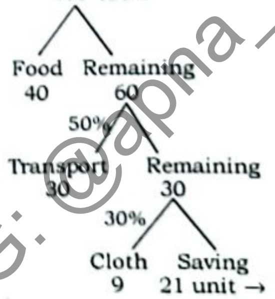
371. (a) If saving = 25%
then expenditure = 100 − 25 = 75%
(3 + 2) unit → 75%
5 unit → 75%
1 unit → 15%
2 unit → 15 × 2 = 30%

Alternate Method:
If saving = 25%
then expenditure = 100 − 25 = 75%


Food
3
:
Edu.
2
Total exp.
5
×15
×15
30%
75%

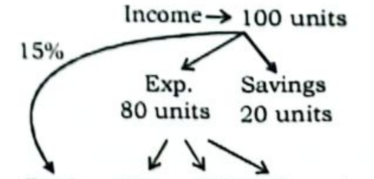
372. (b) Let income = x
$\Rightarrow x \times \frac{3}{5} \times \frac{1}{2} \times \frac{7}{10} = 1260$
$\therefore x =$ ₹6000

Alternate Method:
Let the total income of a man
= 100 unit


100 Total
Food
40
Remaining
60
50%
Transport
30
Remaining
30
30%
Cloth
9
Saving

21 unit → 1260
100 unit → 100 × 60
= Rs.6000

373. (b)


Income→ 100 units
15%
Exp.
80 units
Savings
20 units
Food
15 units
Rent
12800
Edu.
32000
Shopping
7200

ATQ,

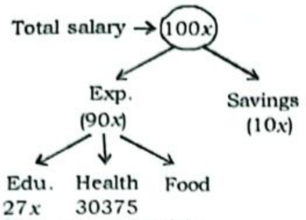
$80 \times \frac{11.25}{100}$ units = 7200

⇒ 1 unit = 800

∴ Food = 15 unit = 800 × 15

= ₹12000

374. (c) Let the income of the candidate = 100x

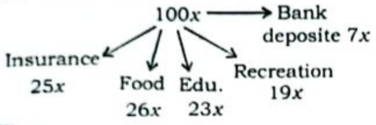

Total salary → 100x
Exp. (90x)
Savings (10x)
Edu. 27x
Health 30375
Food

% of income on health

$= \frac{30375}{75000} \times 100 = 40.5\%$

∴ Food = 90 − (27 + 40.5) = 22.5%

375. (d) Let the total income = 100x


100x
Bank deposite 7x
Insurance 25x
Food 26x
Edu. 23x
Recreation 19x

Then,

Food + Recreation = 26x + 19x = 45x

ATQ,

7x = 26600

∴ 45x = 3800 × 45 = 171000

Alternate Method:

Remaining amount percentage

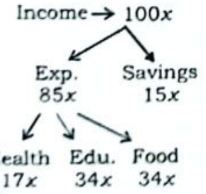
= 100% − 25% − 26% − 23% − 19% = 7%

Food + Recreation = 26% + 19% = 45%

7% = 26600

$45\% = \frac{26600}{7} \times 45 = 171000$

376. (a)


Income → 100x
Exp. 85x
Savings 15x
Health 17x
Edu. 34x
Food 34x

A.T.Q,

3 × 34x − 100x = ₹300

⇒ 102x − 100x = 300 ⇒ 2x = ₹300

377. (b) Income = 100%

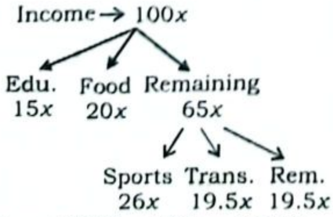
Expenditure

= 15% + 40% + 10% + 15% = 80%

EMI = 100 − 80 = 20%

i.e $80000 \times \frac{20}{100}$ = ₹16000

378. (c)


Income → 100x
Edu. 15x
Food 20x
Remaining 65x
Sports 26x
Trans. 19.5x
Rem. 19.5x

19.5x = 10257 ⇒ 100x = 52600

379. (d) Salary = 75000

Exp. = 12000 + 14000 + 15000 + 10000

= 51000

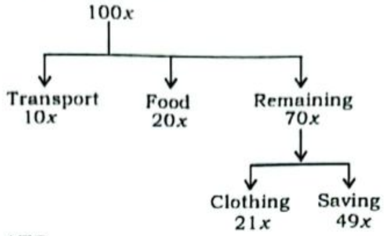
Savings = 21000

Donation = 75000 − 72000

= 3000

∴ Required% $= \frac{3000}{75000} \times 100 = 4\%$

380. (b) Let total income = 100x


100x
Transport 10x
Food 20x
Remaining 70x
Clothing 21x
Saving 49x

ATQ,

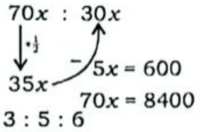
49x = 26460

$41x = \frac{26460}{49} \times 41$ = ₹22140

381. (a)

I : E : S

100x : 70x : 30x

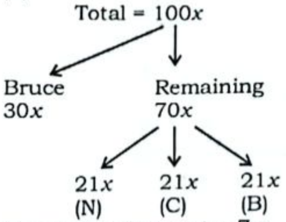

×½
35x
−
5x = 600
70x = 8400

H : F : E = 3 : 5 : 6

Exp. on Education

$= \frac{8400}{14} \times 6 = 600 \times 6 = 3600$

382. (b)


Total = 100x
Bruce 30x
Remaining 70x
21x (N)
21x (C)
21x (B)

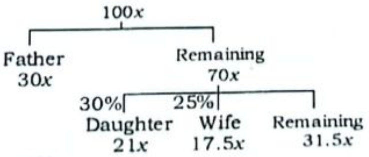
Remaining Amount = 7x

Amount in marvel's fund = 3.5x

3.5x = 14000

100x = 400000

383. (b) Let, Aman's initial income be 100x


100x
Father 30x
Remaining 70x
30%
25%
Daughter 21x
Wife 17.5x
Remaining 31.5x

ATQ,

$\frac{31.5x}{3} = 42000 \Rightarrow 100x$ = ₹400,000

= 400 thousands

384. (c) 40% + 18% + 12% + 5% = 75%

Saving = 100% − 75% = 25%

∵ 25% = 20000 − 16000 = 4000

100% = ₹16000

385. (a) Given,

Total Family income = ₹ 35,000

Total saving = 8%

Rent	Health	Food	Enter - tainment	Edu - cation
11	9	6	2	18

Total Expense = 92% of 35000

$\Rightarrow 46 \text{ unit} = 35000 \times \frac{92}{100}$

⇒ 1 unit = 700

Expenditure on education

= 18 × 700 = ₹12600

386. (a) Total marks = 80,

passing marks = 32

By options :

(a) D's marks $= \frac{12}{19} \times 80 = 50.52$

(b) B's marks $= \frac{7}{11} \times 80 = 50.90$

(c) A's marks $= 80 \times \frac{72}{100} = 57.6$

(d) C's marks $= \frac{32 \times 160}{100} = 51.2$

Hence, option (a) is right answer.

387. (d)

Appeared : Fail : Pass

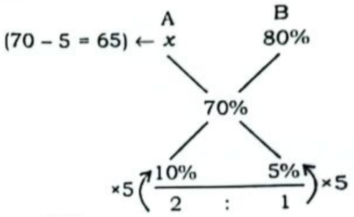
X → 100 : 20 : 80

Y → 230 ⑬ 217

Total students passed from both school $= \frac{330 \times 90}{100} = 297$

Y (Fail%) $= \frac{13}{230} \times 100 = 5.65 \sim 5.7$

388. (a)


A
(70 − 5 = 65) ← x
B
80%
70%
×5
10%
5%
×5
2
:
1

x = 65%

∴ Marks score in paper A

$= 10 \times \frac{65}{100} = 6.5$

389. (b) ATQ,

$(7x + 11x + 10x) \times \frac{1}{2} = (3y + 5y + 6y)$

$28x \times \frac{1}{2} = 14y \Rightarrow \frac{x}{y} = \frac{1}{1}$

So the maximum marks will be

= 7, 11, 10

And marks scored by him = 3, 5, 6

We can see that in only one exam he got more than 50% marks.

390. (d)

IT : A : EE

30% : 30% : 40%

90% : 95% : 75%

27 : 28.5 : 30

∴ Total score

= 27 + 28.5 + 30 = 85.5%

391. (c)

Boys Girls

Total → 100 x 100y

Fail → 20x 15y → 5[4x + 3y] = 90

Pass → 80x 85y 4x + 3y = 18

16x + 12y = 72 ...(ii)

5[16x − 17y] = 70

16x − 17y = 14 ...(i)

From (i) & (ii)

y = 2, x = 3

∴ Total number of Students

= 100 × 3 + 100 × 2 = 500

392. (a) A : B : C : D

$\underbrace{45 : 54 : 50 : 60}_{-}$

15 unit

$\therefore$ Required % $= \frac{15}{45} \times 100$

$= \frac{1}{3} \times 100 = 33\frac{1}{3}\%$

393. (c) Pass % of whole class

$= \frac{5+9+14+18+60}{25+30+40+45+60} \times 100$

$= \frac{106}{200} \times 100 = 53\%$

394. (c) Appeared : Fail : Pass

X → 100 : 30 : 70

Y → 250

Total students passed from both school $= \frac{350 \times 80}{100} = 280$

Students passed from school Y
$= 280 - 70 = 210$

Students failed from school Y
$= 250 - 210 = 40$

$\therefore$ Required% $= \frac{40}{250} \times 100 = 16\%$

395. (b)

B : A : C : D

$100 : 145 : \frac{40}{100} \times 245 : 98 \times \frac{120}{100}$

$= 98$ $= 117.6$

17.6 unit = 13200

98 unit $= \frac{13200}{17.6} \times 98 = 73500$

396. (b) A B C

$\underbrace{10\% \quad 7\%}_{3\%} \quad 9\%$

3% → 900

(A) 10% → 3000 ⇒ (B) 7% → 2100

Donation by C = 5100 – 600 = 4500

9% → 4500

$\therefore$ 100% → 50000

397. (d) ATQ,

Total amount

$= 80 \times \frac{30}{100} \times 80 + 10 \times \frac{40}{100} \times 80$

$= 1920 + 320 = 2240$

398. (d) $x\% = \frac{12500-10000}{10000} \times 100 = 25\%$

$y\% = \frac{14400-12000}{12000} \times 100 = 20\%$

$\therefore \left(\frac{x-y}{y} \times 100\right)\% = \left(\frac{25-20}{20} \times 100\right) = 25\%$

399. (c) $180\left(\frac{100-x}{100}\right) = 60\left(\frac{100+x}{100}\right)$

$\Rightarrow 300 - 3x = 100 + x$

$\Rightarrow 4x = 200 \Rightarrow x = 50\%$

Then, 50% of 410 = 205

and 70% of 210 = 147

$\therefore$ Required % $= \frac{205-147}{147} \times 100$

$= \frac{58}{147} \times 100 = 39.46\%$

SMART APPROACH:-

$(180) \xrightarrow[-60]{-x\%} \boxed{120} \xrightarrow[+60]{+x\%} (60)$

$x = \frac{60}{120} \times 100 = 50\%$

Now,

$410 \times 50\% : 70\% \times 210$

$\Rightarrow 205 : 147$

Req.% $= \frac{58}{147} \times 100 = 39.46\%$

400. (c) $110\left(\frac{100-x}{100}\right) = 50\left(\frac{100+x}{100}\right)$

$\Rightarrow \frac{100-x}{100+x} = \frac{5}{11}$

$\Rightarrow 1100 - 11x = 500 + 5x$

$\Rightarrow 16x = 600$

$\Rightarrow x = \frac{75}{2}\%$

Now, $x\%$ of 650 : $(x + 20\%)$ of 180

$650 \times \frac{75}{200} : 180 \times \frac{115}{200}$

325 : 138

% increase $= \frac{325-138}{138} \times 100$

$= \frac{187}{138} \times 100 = 135.5\% = 136\%$

SMART APPROACH:-

110 50

11 : 5

$\frac{11+5}{2} = 8$

$\frac{3}{8} \times 100 = 37.5\% = x$

Now, $x\%$ of 650 : $(x + 20\%)$ of 180

$650 \times \frac{75}{200} : 180 \times \frac{115}{200}$

325 : 138

% Increase $= \frac{325-138}{138} \times 100$

$= \frac{187}{138} \times 100 = 135.5\% = 136\%$

401. (c) ATQ,

$\left(\frac{x+20}{100} \times 250\right) = \frac{x}{100} \times 220 \times \frac{125}{100}$

$\Rightarrow x = 200$

$\therefore$ 10% of 250 = 25

and 15% of 200 = 30

$\therefore$ Required% $= \frac{5}{30} \times 100 = 16\frac{2}{3}\%$

402. (d) $10\% = \frac{1}{10}$, $25\% = \frac{1}{4}$

We know that,

Dividend = Divisor × Quotient + Rem

Actual : Wrong

Dividend → $10x$: $11x$

Divisor → $4y$: $5y$

A.T.Q,

$\Rightarrow 10x = 4y \times 25 + 0 \Rightarrow \frac{x}{y} = \frac{10}{1}$

Wrong Dividend, $11x = 110$

Wrong Divisor, $5y = 5$

Quotient obtained by Pranjal
$= 110 \div 5 = 22$

SMART APPROACH:-

Let, original number be 100

Original → Mistaken

4)100(25 5)110(22

0 0

403. (a) We know that,

Dividend = Divisor × Quotient + Rem

Actual : Wrong

Dividend → $10x$: $9x$

Divisor → $5y$: $4y$

A.T.Q, $10x = 5y \times 24 + 0$

$\Rightarrow \frac{x}{y} = \frac{120}{10} = \frac{12}{1}$

Wrong Dividend, $9x = 108$

Wrong Divisor, $4y = 4$

$\therefore$ Quotient obtained by Suhas
$= 108 \div 4 = 27$

SMART APPROACH:-

Original → Mistaken

5)120(24 4)108(27

0 0

404. (d) 42% of Ranita = 56% of Bhaskar

$\Rightarrow \frac{\text{Ranita}}{\text{Bhaskar}} = \frac{56}{42} = \frac{4}{3}$

Ranita : Bhaskar

$4x$: $3x$

$\Rightarrow \frac{4x}{3x+200} = \frac{5}{4}$

$\Rightarrow x =$ ₹1000

Therefore, Ranita's weekly income
$= 4 \times 1000 =$ ₹4000

405. (c) Ranita × 57% = Bhasker × 76%

$\Rightarrow \frac{\text{Ranita}}{\text{Bhasker}} = \frac{76}{57} = \frac{4}{3}$

If income of Bhasker is not change then we equate his income in both the week ratio by multiplying it 5 and 3.

R B

$(4 : 3)_{\times 5} \rightarrow 20 : 15$

$\downarrow^{+2}$

$(6 : 5)_{\times 3} \rightarrow 18 : 15$

2 unit → 400

1 unit → 200

15 unit → 3000

406. (b)

Total : P : E : T : Savings

30%

100 : 50 : 10 : 1.5 : 100–61.5
= 38.5

130 : 65 : 19.5 : 3.9 : 130–88.4
= 41.6

Total savings
$= \frac{160000 \times 80.1}{100} = 128160$

Alternate Method:

Total : P : E : T : Savings

100 : 50 : 10 : 1.5 : 100–61.5 = 38.5

100 : 50 : 15 : 3 : 100–68 = 32

+30%

41.6

Total savings = 38.5 + 41.6 = 80.1

100 unit = 160000

80.1 unit = 128160

407. (a)

I	E	T	C	Saving
100	60	12	1.8	26.20
140	84	25.2	5.04	25.76

Ratio of Saving = 26.20 : 25.76
= 655 : 644

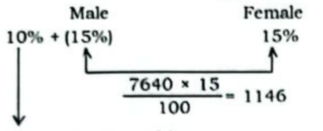
Alternate Method

I	E	T	C	Saving
100	60	12	1.8	26.20
100	60	18	3.6	18.40

Ratio of Saving

$= 26.20 : 18.40 \times \frac{140}{100} = 655 : 644$

408. (d) Total increment = 9214 − 7640
= 1574

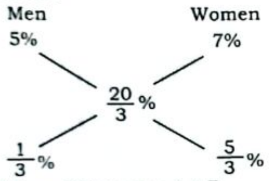


1574 − 1146 = 428
10% (male) = 428
100% (male) = 4280
Female = 7640 − 4280 = 3360
Difference = 4280 − 3360 = 920

409. (b) Overall % Increase

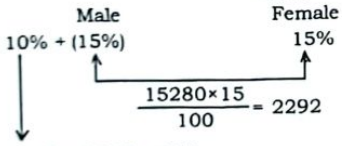
$= \frac{19200-18000}{18000} \times 100\%$

$= \frac{1200}{18000} \times 100\% = \frac{20}{3}\%$



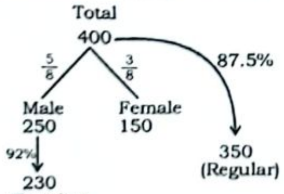
∴ Man : Women = 1 : 5

410. (a) Total increment = 18428 − 15280
= 3148



3148 − 2292 = 856
10% (male) = 856
100% (male) = 8560
Female = 15280 − 8560 = 6720
Male − Female = 8560 − 6720 = 1840

411. (a)



Regular female employees
= 350 − 230 = 120
% of Regular female employees

$= \frac{120}{150} \times 100 = 80\%$

SMART APPROACH:-

Male : Female
5 : 3
Regular/ Empoyees ⟶ 92% : x %
87.5%

$x\% = 87.5 - \frac{5 \times 4.5}{3} = 80\%$

412. (a) 2020 : 2021

Country A → x : $\frac{(100-p)x}{100}$

Country B → 1 : $\frac{(100-q)}{100}$

Ratio in 2021

$\therefore \frac{A}{B} = \frac{(100-p)x}{(100-q)}$

$\therefore \%\ \text{Change} = \frac{x - \frac{(100-p)x}{(100-q)}}{x} \times 100$

$= \frac{(100-q-100+p)x}{(100-q)x} \times 100$

$= \frac{100(p-q)}{100-q}$

Alternate Method:

Let, p = 20%, q = 10%

2020 : 2021
Country A → 5 : 4
Country B → 10 : 9

$\therefore \frac{A}{B} = \frac{5}{10} \times \frac{9}{4} = \frac{45}{40}$

$\%\ \text{Change} = \frac{45-40}{45} \times 100 = \frac{100}{9}\%$

Go through options,

$\frac{100(p-q)}{100-q} = \frac{100(20-10)}{100-10}$

$= \frac{1000}{90} = \frac{100}{9}\%$

413. (d) **1st Approach: (Ratio Method)**

$20\% = \frac{-1}{5}$

Here selling of 20% eggs occur 3 times and addition of b% occur 2 times

$$\begin{array}{ccc} (5)^3 & : & (4)^3 \\ (x)^2 & : & (y)^2 \\ \hline 500 & : & 1024 \end{array} \Rightarrow \times 1 \left(\begin{array}{ccc} 125 & : & 64 \\ (1)^2 & : & (2)^2 \\ \hline 125 & : & 256 \end{array} \right) \times 4$$

$= 125 : 256$

$x : y = 1 : 2$

$b = \frac{2-1}{1} \times 100 = 100\%$

2nd Approach: (By Option)

By options, let b = 100%

1st day ⟶ 500 $\xrightarrow{-20\%}$ 400 $\xrightarrow{+100\%}$

2nd day ⟶ 800 $\xrightarrow{-20\%}$ 640 $\xrightarrow{+100\%}$

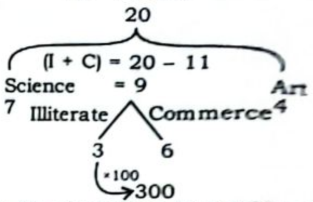
3rd day ⟶ 1280 $\xrightarrow{-20\%}$ 1024

3rd Approach: (By Logic)

Since the number of eggs was reduced three times by 20% and increased twice by b%, the total number of eggs increased from 500 to 1024. Hence, the value of b must be greater than 20%, eliminating options (a) and (b). The value of b cannot be 500 because if it were, a single increment would make the total six times the original value, which is not possible. Therefore, option (d) is correct.

⁂

414. (c) $35\% = \frac{7 \rightarrow \text{Science}}{20 \rightarrow \text{Total}}$



∴ (S + A) = 11 units = 11 × 100 = 11

Alternate Method:

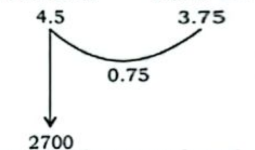
Let, total number of employees = 10
∴ S = 35%

$\therefore A = \frac{1}{5} \times 100\% = 20\%$

∴ I + C = 100% − (35 + 20) % = 4
∵ 45% = 300 + 2(300) = 900

$\therefore (35+20)\% = \frac{900}{45} \times 55 = 1100$

415. (b)



Quantity of accumulated rice

$= \frac{2700 \times .75}{4.5}$ kg.

Cost price of rice = 40 per kg bu
sell doubled at price it means = S
= 40 × 2 = 80/kg
After pay 125% fine

$= \frac{2700}{4.5} \times 0.75 \times 80 \times \frac{5}{4} = 45{,}000$

Alternate Method:

Government : Distributor
4.5 kg/person : 3.75 kg/person

Distributor gain at 4.5 kg.
= 4.5 − 3.75 = 0.75 kg
So, 4.5 kg → 0.75 kg

$1\ \text{kg} \rightarrow \frac{0.75}{4.5}$

Gain at 2700kg $= \frac{0.75}{4.5} \times 2700 = 450$

Distributor earn in black mar
= 450 × 80
Then, Distributor pay fine

$= 450 \times 80 \times \frac{125}{100} = 45{,}000$

416. (a)

	Rice	:	Wheat
Weight →	20kg		8kg
Price →	x		5 x

$20x + 40x \rightarrow 300$
$x \rightarrow 5$

The new price of wheat = 5 × 5 ×
= ₹30

Now,
Let, new consumption of rice K

	Rice	:	Wheat
Weight →	K		8
Price →	Rs.5		Rs.30

5K + 240 → 300
5K = 60 ⇒ K = 12

$\therefore \%\text{Reduction} = \frac{20-12}{20} \times 100 = 40\%$

02 Chapter

PROFIT & LOSS

• TYPE – I •
BASIC QUESTIONS

1. A wrist watch was purchased for ₹3,000 and sold for ₹3,500. Find the profit percentage.

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 19.58% (b) 18.33%
(c) 16.66% (d) 20.50%

2. A table was bought for ₹3,000 and sold for ₹ 3,200. Find the gain or loss in terms of money.

SSC CGL 17/07/2023 (Shift-03)

(a) Gain 200 (b) Loss 200
(c) Gain 100 (d) Loss 150

3. Mihir buys a book for ₹625. However, because of certain urgency, he sells it for ₹550. Find his loss percentage.

SSC CPO 05/10/2023 (Shift-01)

(a) 10% (b) 12%
(c) 14% (d) 15%

4. Ravath had to sell vegetables worth ₹4,960 for ₹4,712 due to weather conditions. What is the loss percentage that he has incurred?

SSC CHSL 05/07/2024 (Shift-01)

(a) 10% (b) 15%
(c) 5% (d) 20%

5. A man buys 10 identical articles for a total of ₹15. If he sells each of them for ₹1.7, then his profit percentage will be __________ % (rounded off to two decimal place).

SSC CGL TIER-II (18/01/2025)

(a) 14.33% (b) 12.76%
(c) 13.33% (d) 11.76%

6. A shopkeeper bought an oven for ₹25,000 and sold it for ₹29,500. He spent 1,500 as overheads. What is his loss or gain percentage (rounded off to the nearest integer)?

SSC MTS 13/09/2023 (Shift- 03)

(a) Gain by 13% (b) Gain by 11%
(c) Loss by 11% (d) Loss by 13%

7. An article is sold at a profit of 250%. What is the ratio of its cost price to selling price?

SSC CGL 13/09/2024 (Shift-01)

(a) 2 : 5 (b) 5 : 2
(c) 2 : 7 (d) 7 : 2

8. An old HP Deskjet printer was bought for ₹4,800 and ₹500 was spent on its repair. If it was sold for ₹6,360, then its profit percentage is.

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 15 (b) 12
(c) 18 (d) 20

9. The cost price of an article is ₹6,450. If it sold at a profit 16%, how much would be its selling price?

SSC CHSL 25/05/2022 (Shift- 02)

(a) ₹7,482 (b) ₹7,428
(c) ₹7,842 (d) ₹7,282

10. Sandeep made a profit of 22% when he sold an over cost for Rs.8540. Find the cost price of the over cost.

SSC CHSL TIER-II (18/11/2024)

(a) Rs.6500 (b) Rs.6000
(c) Rs.7000 (d) Rs.7500

11. From the given data, find the ratio of the cost prices of a shirt and a trouser.

Item	Selling Price	Profit
Shirt	1,200	20%
Trouser	660	10%

SSC CGL 18/09/2024 (Shift-02)

(a) 2 : 1 (b) 1 : 3
(c) 3 : 4 (d) 5 : 3

12. Sukrit purchased an item for ₹650 and sold it at a profit of 26%. At what price (in ₹) did Sukrit sell the item?

SSC Phase-XII 26/06/2024 (Shift-02)

(a) 819 (b) 813
(c) 823 (d) 829

13. A shopkeeper charges his customer 14% more than the cost price. If a customer paid ₹18,240 for a mobile phone, then the cost price of the mobile phone was:

SSC CHSL 08/07/2024 (Shift-01)

(a) ₹20,793.60 (b) ₹16,000
(c) ₹16,600 (d) ₹15,686.40

14. By selling a hair oil product for ₹336, the gain is 12%. If the gain is reduced to 9%, find the resultant selling price (in ₹).

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 330 (b) 300
(c) 327 (d) 339

15. By selling a car for ₹2,78,000, a dealer gains 25%. If the profit is reduced to 18%, then the selling price will be:

SSC CGL 02/12/2022 (Shift-04)

(a) ₹2,62,432 (b) ₹2,65,432
(c) ₹2,72,432 (d) ₹2,60,432

16. If an article is sold for ₹402, there is a loss of 33%. At what price should it be sold to get 37% profit?

SSC CHSL 14/08/2023 (Shift-01)

(a) ₹911 (b) ₹846
(c) ₹822 (d) ₹781

17. When an article is sold for ₹480, there is a loss of $16\frac{2}{3}\%$. To gain $8\frac{1}{3}\%$, it should be sold for ₹ :

(a) ₹620 (b) ₹624
(c) ₹605 (d) ₹750

18. A man sells a cow for ₹22,000 and gains 10%. At what price should he sell the same cow, in order to gain 14%?

SSC Phase-XII 21/06/2024 (Shift-03)

(a) ₹23,000 (b) ₹23,800
(c) ₹22,800 (d) ₹22,900

19. By selling an article for ₹2,200, a profit of 10% is earned. If the same article is sold for ₹2,600, then what will be the gain percentage?

SSC CGL TIER-II 03/02/2022

(a) 20% (b) 15%
(c) 37% (d) 30%

20. A man loses 28% by selling an article for Rs.144. If he sells it for Rs.288, what will be his gain/loss percentage?

SSC CGL 25/09/2024 (Shift-02)

(a) Gain, 41% (b) Loss, 43%
(c) Gain, 44% (d) Loss, 46%

21. A pen was sold for ₹166.44 with a profit of 14%. If it were sold for ₹154.76, then what would have been the percentage of profit or loss?

SSC CGL 02/12/2022 (Shift-01)

(a) 5% loss (b) 6% profit
(c) 5% profit (d) 6% loss

22. If I gain 124% by selling an item for ₹1,232, then what would be my gain or loss percentage if I sell it for ₹572?

SSC MTS 05/10/2021 (Shift- 01)

(a) 6% Gain (b) 6% Loss
(c) 4% Loss (d) 4% Gain

23. A seller decreased the selling price o each item from ₹5,000 to ₹4,680, by which his loss percentage increase by 4%. If he has go get 4% profit, the the selling price of the item should be

SSC CHSL 03/07/2024 (Shift-04

(a) ₹8,320 (b) ₹7,280
(c) ₹7,800 (d) ₹8,840

24. Samreen sells a keyboard for Rs. 1,26 at a profit of 25%, and anothe keyboard for Rs. 1,440 at a loss of 10%. What is her total gain or loss

SSC CGL 24/09/2024 (Shift-0

(a) $3\frac{86}{163}\%$ Loss (b) $3\frac{11}{27}\%$ Gain
(c) $3\frac{11}{27}\%$ Loss (d) $3\frac{86}{163}\%$ Gain

25. If books bought at prices ranging from ₹200 to ₹260 are sold at prices ranging from ₹250 to ₹300, what is the greatest possible profit that might be made in selling 25 books?

SSC CGL 26/09/2024 (Shift-01)

(a) ₹2,300 (b) ₹2,500
(c) ₹1,800 (d) ₹2,700

26. A mobile phone dealer buys a phone for ₹10,000 and sells it for ₹12,000. Later, he realizes that he could have sold it for ₹13,000. What is the percentage loss that he incurs?

SSC CHSL 05/07/2024 (Shift-03)

(a) 10% (b) 20%
(c) 15% (d) 25%

27. Manjeet bought a second-hand motorbike for ₹22,000 and spent ₹3,000 on its overhauling and maintenance. He then sold it with 12% profit. If he had sold it for ₹500 less, then what would have been his profit percentage?

SSC CGL 20/04/2022 (Shift-01)

(a) 10% (b) 10.5%
(c) 8% (d) 5%

28. A merchant sells 195 kg. of wheat for ₹10,260 at a profit of ₹4.50 per kg. of wheat. What is the cost price (in ₹, to the nearest integer) of 15 kg. of wheat?

SSC CHSL 10/07/2024 (Shift-03)

(a) 722 (b) 682
(c) 595 (d) 750

29. A shopkeeper bought 288 oranges for ₹115.20. He sold 50 of them at 70 paise each and the remaining at ₹46.20. Find his profit or loss.

SSC CHSL 02/07/2024 (Shift-03)

(a) Profit, ₹25 (b) Loss, ₹34
(c) Profit, ₹37 (d) Loss, ₹36

30. A shopkeeper buys 1800 kg wheat for ₹32,400. If 20% of this wheat is spoiled due to rain, at what rate (₹/kg) should he sell the rest to earn 20%?

SSC CHSL 04/07/2024 (Shift-05)

(a) 29 (b) 26
(c) 25 (d) 27

31. A trader buys 500 kg cotton for ₹8,000. If 10% of this cotton is spoiled due to rain, at what rate (₹/kg) should he sell the rest to earn a 20% profit?

SSC CHSL 09/07/2024 (Shift-01)

(a) $21\frac{1}{3}$ (b) $22\frac{1}{3}$
(c) $25\frac{1}{3}$ (d) $23\frac{1}{3}$

32. A retailer purchased a batch of goods for ₹5,000. Due to a manufacturing defect, 5% of the goods were damaged. If the retailer wants to make a profit of 20% on the remaining goods, at what price should the undamaged goods be sold?

SSC CHSL 04/07/2024 (Shift-03)

(a) ₹5,700 (b) ₹5,800
(c) ₹6,000 (d) ₹5,900

33. A grocer purchased 10 kg rice for ₹700. He spends some amount on transportation and then sells it for ₹1,400. If the percentage of profit made by the grocer is 30%, then what is the amount (in) he spends on transportation? (Round off to the nearest integer)

SSC CPO 27/06/2024 (Shift-03)

(a) 350 (b) 380
(c) 300 (d) 377

34. A vendor buys 20 laptop bags for ₹13,000 and sells them at 15 for ₹10,125. How many laptop bags should be bought and sold to earn a profit of ₹3,225?

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 123 (b) 129
(c) 120 (d) 127

35. A shopkeeper bought 95 dozen oranges at ₹4.50 each. 7 dozen oranges were rotten and so were discarded. He sold the remaining oranges at ₹78 per dozen. What is his profit or loss per cent (to the nearest integer)?

SSC CHSL 12/08/2021 (Shift- 02)

(a) Loss, 45% (b) Profit, 34%
(c) Loss, 34% (d) Profit, 45%

◆ TYPE – II ◆
DIFFERENCE BETWEEN SP & CP

36. The difference between the cost price and the selling price of an article is ₹1,800. If there is a profit of 20%, then the cost price of the article is:

SSC CHSL 02/07/2024 (Shift-04)

(a) ₹9,000 (b) ₹8,000
(c) ₹11,000 (d) ₹7,000

37. A shopkeeper sold an article at a 26% profit. On selling it for ₹2,250 more, he would get a profit of 41%. If this article is sold at 12% profit, then the selling price would be:

SSC CHSL 11/07/2024 (Shift-03)

(a) ₹16,800 (b) ₹15,000
(c) ₹15,800 (d) ₹16,120

38. A trader sells an article at 16% below its cost price. Had he sold it for ₹192.20 more, he would have gained 15%. The new selling price (in ₹) of the article is:

SSC CPO 29/06/2024 (Shift-01)

(a) 742 (b) 731
(c) 713 (d) 724

39. A man sold his cycle at 17% loss. If he had sold it for 1,056 more, he would have made 5% profit. The cost price of the cycle is:

SSC MTS 08/09/2023 (Shift- 02)

(a) ₹4,700 (b) ₹4,800
(c) ₹5,100 (d) ₹3,800

40. A seller sold a bag at a profit of 12%. If he had sold it for ₹900 more, he would have gained 27%. What is the CP of the bag?

SSC CHSL 17/08/2023 (Shift-02)

(a) ₹6,000 (b) ₹6,500
(c) ₹5,560 (d) ₹7,000

41. On selling a table for ₹210 and ₹420 there will be loss of L_1% and L_2% respectively. If $L_1 - L_2 = 7$, then what is the cost price of table?

SSC CHSL 17/03/2023 (Shift-01)

(a) ₹5,000 (b) ₹3,000
(c) ₹7,000 (d) ₹4,000

◆ TYPE – III ◆
CP OF (X) = SP OF (Y)

42. If the cost price of 28 oranges is equal to selling price of 24 oranges, then the profit percentage is:

SSC CGL 27/07/2023 (Shift-03)

(a) $16\frac{2}{3}\%$ (b) $16\frac{1}{3}\%$
(c) $18\frac{2}{3}\%$ (d) $18\frac{1}{3}\%$

43. If the selling price of 40 articles is equal to the cost price of 50 articles, then the percentage gain is:

SSC CHSL 01/07/2024 (Shift-04)

(a) 25% (b) 20%
(c) 35% (d) 30%

44. If the selling price of 100 pens is equal to the cost price of 140 pens, find the profit percentage.

SSC CHSL 01/07/2024 (Shift-03)

(a) 36% (b) 45%
(c) 40% (d) 30%

45. The selling price of 84 items is equal to the cost price of 105 items. What is the percentage of profit gained in the transaction?

SSC Phase-XII 21/06/2024 (Shift-02)

(a) 28% (b) 20%
(c) 25% (d) 21%

46. The selling price of 80 items is equal to the cost price of 72 items. What is the percentage of loss incurred in the transaction?

SSC Phase-XII 24/06/2024 (Shift-02)

(a) 12% (b) 10%
(c) 9% (d) $11\frac{1}{9}\%$

47. A shopkeeper bought 30 books and sold 25 books for same price. What percentage had he gained or lost?

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 20% loss (b) 20% gain
(c) 25% gain (d) 25% loss

48. If the selling price of 50 articles is equal to the cost price of 42 articles, then what is the approximate loss or profit percentage?

SSC CPO 24/11/2020 (Shift-2)

(a) 8% profit (b) 16% loss
(c) 10% loss (d) 20% profit

49. The cost price of 36 articles is the same as the selling price of N articles. If the profit is 20%, then the value of N is:

SSC CPO 27/06/2024 (Shift-01)

(a) 25 (b) 42
(c) 40 (d) 30

50. The selling price of y items is equal to the cost price of 540 items. If the profit made is 44%, then find the value of y.

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 375 (b) 400
(c) 360 (d) 380

51. The cost price of 240 articles is the same as the selling price of x articles. If profit is 20%, find the value of x.

SSC CHSL 09/08/2023 (Shift-02)

(a) 200 (b) 210
(c) 180 (d) 240

52. The cost price of 44 items is the same as the selling price of x items. If the profit is 10%, then what is the value of x?

SSC CHSL 21/03/2023 (Shift-04)

(a) 55 (b) 40
(c) 60 (d) 50

53. If 70% of the cost price of an article is equal to 40% of its selling price, what is the profit percentage?

SSC CHSL 04/07/2024 (Shift-01)

(a) 85% (b) 80%
(c) 70% (d) 75%

• TYPE – IV •
PROFIT / LOSS = CP/SP OF SOME ARTICLES

54. By selling 42 m of cloth, Vijay gains the selling price of 7 m of cloth. find the profit percentage.

SSC CPO 04/10/2023 (Shift-3)

(a) 20% (b) 30%
(c) 25% (d) 15%

55. By selling 60 pens, a man gain an amount equal to the selling price of 12 pens. What is his gain percentage?

SSC CHSL 09/07/2024 (Shift-03)

(a) 20% (b) 22%
(c) 25% (d) 27%

56. By selling 22 items, Rohit gains the selling price of 6 items. His gain per cent is:

SSC CHSL 09/07/2024 (Shift-04)

(a) $37\frac{1}{2}\%$ (b) $37\frac{1}{3}\%$
(c) $33\frac{1}{2}\%$ (d) $33\frac{1}{3}\%$

57. In a medical transaction, 17 times the cost price is equal to 8 times the sum of the cost price and the selling price. What is the gain or loss percentage?

SSC CGL TIER-II 03/02/2022

(a) Loss 15% (b) Gain 17.5%
(c) Gain 12.5% (d) Loss 30%

58. By selling two articles for ₹800, a person gains the cost price of three articles. The profit percent is:

SSC CGL TIER-II 11/09/2019 (Shift-04)

(a) 125% (b) 140%
(c) 120% (d) 150%

59. By selling 30 meters of cloth a shopkeeper makes a profit equivalent to the selling price of 10 meters of cloth. Find the selling price of 1 meter of cloth when the cost price of 1 meter of cloth is ₹480.

SSC CHSL 03/07/2024 (Shift-03)

(a) ₹520 (b) ₹720
(c) ₹960 (d) ₹820

• TYPE – V •
PROFIT / LOSS ON SELLING PRICE

60. If loss is $\frac{1}{8}^{th}$ of the selling price, then the actual loss percentage is:

SSC MTS 14/09/2023 (Shift- 03)

(a) $8\frac{5}{9}\%$ (b) $11\frac{1}{9}\%$
(c) $10\frac{1}{9}\%$ (d) $7\frac{4}{9}\%$

61. On selling an article for ₹800, a person loses 20% of its selling price. At what price should he sell it to gain 25% on its cost price?

SSC CGL 04/06/2019 (Shift-02)

(a) ₹1280 (b) ₹1152
(c) ₹1250 (d) ₹1200

62. A man purchased a cell phone for ₹24,500 and sold it at a gain of 12.5% calculated on the selling price. The selling price of the cell phone was:

SSC CHSL 24/05/2022 (Shift- 01)

(a) ₹25,000 (b) ₹28,000
(c) ₹27,500 (d) ₹25,500

63. By selling an article for ₹640, a person loses 15% of its selling price. At what price (in ₹) should he sell it to gain 15% on its cost price?

SSC CGL 17/08/2021(Shift- 01)

(a) ₹835 (b) ₹832
(c) ₹836.60 (d) ₹846.40

64. Find the gain percentage, given that Priya sold her scooter for ₹42564 gaining $\frac{1}{6}$ th of the selling price.

SSC CGL 10/09/2024 (Shift-01)

(a) 30% (b) 20%
(c) 15% (d) 40%

65. Find the gain percentage, given that Siddhi sold her scooter for ₹71785 gaining $\frac{1}{5}$ th of the selling price

SSC CGL 18/09/2024 (Shift-02)

(a) 20% (b) 25%
(c) 10% (d) 15%

66. Find the gain percentage, given that Anubha sold her scooter for ₹23358 gaining $\frac{1}{6}$ th of the selling price.

SSC CGL 19/09/2024 (Shift-03)

(a) 25% (b) 35%
(c) 20% (d) 30%

67. Find the gain percentage, given that Aditi sold her scooter for ₹40620 gaining $\frac{1}{5}$ th of the selling price.

SSC CGL 25/09/2024 (Shift-03)

(a) 10% (b) 20%
(c) 25% (d) 35%

68. An article is sold at a loss of 40%. The nominal amount of loss is approximately what percentage of the selling price of the article?

SSC MTS 05/07/2022 (Shift-03)

(a) 66.67% (b) 38.33%
(c) 41.33% (d) 51.33%

• TYPE – VI •
BUTTERFLY CONCEPT

69. On selling a painting at ₹1,498 the gain is 25% more than the loss incurred on selling it at ₹1,300 . In order to gain 25%, the selling price will be:

SSC CGL 27/07/2023 (Shift-01)

(a) ₹1,735 (b) ₹1,335
(c) ₹1,398 (d) ₹1,388

70. The profit obtained by a vendor on selling goods at ₹3,200 is equal to $\frac{7}{5}$ th of the profit obtained by selling the same goods at ₹3,000. What is the cost price (in ₹) of the goods?

MTS 06/09/2023 (Shift- 01)

(a) 2,500 (b) 2,700
(c) 2,900 (d) 2,400

71. Ravi sells a laptop bag to Reeta for ₹1,920 and he sells another similar laptop bag to Vinay for ₹1,280. The percentage profit earned in selling the laptop bag to Reeta is equal to the percentage loss in selling the laptop bag to Vinay. At what price (in ₹) should Ravi sell the laptop bag to make a profit of 25%?

SSC MTS 08/09/2023 (Shift- 03

(a) 2,000 (b) 1,600
(c) 1,800 (d) 1,650

72. The profit obtained by selling an article for ₹86 is twice the loss obtained by selling the same article for ₹53. Find the cost price.

SSC CHSL 08/07/2024 (Shift-02)

(a) ₹33 (b) ₹22
(c) ₹64 (d) ₹75

73. The percentage profit earned by selling an article for ₹2,100 is equal to the percentage loss incurred by selling the same article for ₹1,460. At what price should the article be sold to make 20% profit?

SSC Phase-XII 21/06/2024 (Shift-01)

(a) ₹2156 (b) ₹2256
(c) ₹2136 (d) ₹2056

74. By selling a watch for ₹1600, a person gets profit is equal to the loss of selling the same watch for ₹1400. If the person wants to get a profit of 20%, at what price should he sell the watch?

SSC CHSL 08/08/2023 (Shift-03)

(a) 1700 (b) 1600
(c) 1800 (d) 1500

75. By selling an article for ₹1,170, Elisa suffers as much loss as she would have gained by selling it at a profit of 22%. If she sells it for ₹1,450, then her profit/loss percent (correct up to one decimal place) is:

SSC CHSL 04/08/2021 (Shift- 1)

(a) Loss, 3.33 (b) Profit, 3.33
(c) Profit, 26.2 (d) Loss, 26.2

76. A man sells a mobile phone for Rs.680 and loses something. If he had sold it for Rs.1070, his gain would have been double the former loss. The cost price (in .) of the mobile phone is:

SSC CGL TIER-II (20/01/2025)

(a) 820 (b) 800
(c) 830 (d) 810

• TYPE – VII •
NUMBER OF ARTICLES

77. If oranges are bought at 11 for ₹10 and sold at 10 for ₹11, what is the gain or loss percentage?

SSC CHSL 14/08/2023 (Shift-03)

(a) Gain 11% (b) Loss 11%
(c) Loss 21% (d) Gain 21%

78. A shopkeeper bought 60 pencils at a rate of 4 for ₹5 and another 60 pencils at a rate of 2 for ₹3. He mixed all the pencils and sold them at a rate of 3 for ₹4. Find his gain or loss percentage.

SSC CGL 19/04/2022 (Shift-03)

(a) Profit $2\frac{7}{8}\%$ (b) Loss $3\frac{1}{33}\%$
(c) Loss $2\frac{7}{8}\%$ (d) Profit $3\frac{1}{8}\%$

79. A retail fruit vendor buys a score of apples for Rs. 400 and retails them for Rs. 264 at a dozen. What was his loss/gain percent? (a score = 20 no's)

SSC CHSL 02/07/2024 (Shift-01)

(a) 20% profit (b) 10% loss
(c) 10% profit (d) 5% loss

80. A vendor buys 20 dozen bananas for ₹1,200 and sells 5 dozen for ₹350, then his gain percentage is

SSC CHSL 10/07/2024 (Shift-02)

(a) $21\frac{1}{3}\%$ (b) $15\frac{1}{3}\%$
(c) $13\frac{2}{3}\%$ (d) $16\frac{2}{3}\%$

81. A shopkeeper buys oranges at the rate of 10 oranges for ₹50 and sells them at the rate of 12 oranges for ₹74. Find his gain or loss percentage

SSC CPO 28/06/2024 (Shift-01)

(a) $23\frac{1}{3}\%$ gain (b) 25% gain
(c) 30% loss (d) $25\frac{1}{3}\%$ loss

82. A vendor buys 20 pens for ₹15 and sells them at 15 for ₹20. How many pens should be bought and sold to earn a profit of ₹245?

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 280 (b) 540
(c) 320 (d) 420

83. A shopkeeper buys 60 oranges at 10 for ₹72, and an equal number at 12 for ₹90. He spends ₹118 on the transaction and sells all the oranges that he buys. If there is a profit of 26% in the entire transaction, then what is the selling price of 32 oranges?

SSC MTS 27/10/2021 (Shift- 02)

(a) ₹336 (b) ₹313.60
(c) ₹316.80 (d) ₹320

84. A shopkeeper buys some notebooks at the rate of 12 for ₹222, and an equal number of notebooks at 10 for ₹225. If he sells all the notebooks at a profit of 20%, then the selling price of 15 notebooks is:

SSC CHSL 16/04/2021 (Shift- 02)

(a) ₹369 (b) ₹376.5
(c) ₹360 (d) ₹302.40

• TYPE – VIII •
AVERAGE CONCEPT
(WHEN CP IS SAME)

85. Shopkeeper bought 40 pieces of an article at a rate of ₹50 per item. He sold 35 pieces with 20% profit. The remaining 5 pieces were found to be damaged and he sold them with 10% loss. Find his overall profit percentage.

SSC CGL 13/04/2022 (Shift-03)

(a) 30% (b) 10%
(c) 32.5% (d) 16.25%

86. Mukesh sells 80% part of a commodity at a profit of 20% and rest of the part at a loss of 5% and in this way earns a profit of ₹9,300. What was the cost price of the commodity for Mukesh?

SSC Phase X 05/08/2022 (Shift-03)

(a) ₹61,000 (b) ₹58,000
(c) ₹62,000 (d) ₹60,000

87. A shopkeeper bought certain number of apples for ₹3,600. He sold one-fifth of them at a loss of 10%, one-fourth of the remaining apples at a loss of 5%, and two-third of the rest at a profit of 15%. At what price (in ₹) should he sell the remaining apples to earn a profit of 27% overall?

SSC CGL 25/07/2023 (Shift-01)

(a) ₹1,548 (b) ₹1,584
(c) ₹1,845 (d) ₹1,864

88. A shopkeeper sold $\frac{5}{8}$ of his articles at a gain of 20% and the remaining the cost price. What is his gain percentage in the whole transaction?

SSC CGL 18/09/2024 (Shift-01)

(a) $16\frac{1}{2}\%$ (b) $14\frac{1}{2}\%$
(c) $13\frac{1}{2}\%$ (d) $12\frac{1}{2}\%$

89. Ramesh purchased 130 books at the rate of ₹200 each and sold half of them at the rate of ₹300 each, $\frac{1}{5}$ of them at the rate of ₹350 each and the rest at the cost price. Find his profit percentage.

SSC CGL 25/09/2024 (Shift-01)

(a) 35% (b) 40%
(c) 38% (d) 44%

90. A merchant bought two watches for ₹9,000 each. He sold one watch at a loss of 10%. At what price (in ₹) should he sold the other watch to earn a profit of 18% overall?

SSC CPO 27/06/2024 (Shift-02)

(a) 14,130 (b) 14,310
(c) 13,140 (d) 13,410

91. A vegetable vendor bought 100 kg of potatoes at the rate of ₹19 per kg and spent ₹100 as cartage. He sold 60 kg of potatoes with a 50% profit and half of the remaining stock with a 40% profit. He sold half of the still remaining potatoes with a 25% profit. What profit percentage should he aim for when selling the ultimate remaining potatoes to achieve an overall profit of 42%?

SSC CPO 28/06/2024 (Shift-03)

(a) 0.16 (b) 0.1
(c) 0.12 (d) 0.15

92. On two items of equal prices, T gets 12% profit on one item and incurs 8% loss on other. What is his overall profit or loss percentage?

SSC Phase-XII 26/06/2024 (Shift-03)

(a) Profit, 2% (b) Profit, 4%
(c) Loss, 4% (d) Loss, 2%

93. A shopkeeper purchased 1600 mangoes at the rate of ₹120 per dozen. Out of these, he sold 900 mangoes at ₹15 per mango and the remaining mangoes at ₹14 per mango. His gain percentage is:

SSC CGL 25/07/2023 (Shift-04)

(a) 45.625% (b) 38.265%
(c) 35.625% (d) 48.765%

94. A person bought 80 pens at the rate of ₹80 per pen. He sells 40 pens at a loss of 20%. If profit of 20 percent is earned on the all pens together, then what will be the profit percentage on the remaining 40 pens?

SSC CHSL 09/03/2023 (Shift-02)

(a) 60% (b) 80%
(c) 70% (d) 90%

95. A trader buys two articles for ₹3000 each article, while selling, he earns a profit of 10 percent on one and loses 20 percent on the other. What will be his overall loss percentage?
SSC CHSL 14/03/2023 (Shift-03)
(a) 10% (b) 20%
(c) 15% (d) 5%

96. Shivam purchased two watches, first for ₹12,000 and the second for ₹20,000. He sold both the watches, first one at the profit of 10 percent and the second at a loss of 20 percent. What is the overall profit or loss?
SSC CHSL 20/03/2023 (Shift-03)
(a) Profit = ₹2600 (b) Loss = ₹2800
(c) Loss = ₹2400 (d) Profit = ₹2200

97. A man bought two bicycles for ₹3,000 each. If he sells one bicycle at a profit of 10% then for how much percentage profit should he sell the other bicycle so that he makes a profit of 20% on the whole?
SSC CPO 10/11/2022 (Shift-01)
(a) 15% (b) 25%
(c) 30% (d) 10%

98. Two similar pieces of an item were purchased by paying the same amount for each, and they were sold, respectively, for a profit of 25% and a loss of 20%. What was his profit percentage?
SSC MTS 12/10/2021 (Shift- 02)
(a) 2.5 (b) 2
(c) 4.5 (d) 5

99. A trader purchased 500 kg of sugar at ₹40 per kg. He sold 200 kg of it at a profit of 10% and 120 kg at a loss of 5%. At what rate per kg (in ₹, correct to 2 decimal places) should he sell the remaining sugar to gain 12% on his initial investment?
SSC MTS 18/10/2021 (Shift- 02)
(a) 44.80 (b) 48.67
(c) 50.22 (d) 53.33

100. A fruit merchant bought some bananas. $\frac{1}{5}$th of them got rotten and were thrown away. He sold remaining $\frac{2}{5}$th of the bananas with him at 15% profit and the remaining bananas at 10% profit. Find his overall loss or profit percent?
SSC CGL 23/08/2021(Shift 01)
(a) Profit 9.6% (b) Loss 10.4%
(c) Loss 9.6% (d) Profit 10.4%

◆ TYPE – IX ◆
WHEN SP IS SAME

101. A person sold two cars for ₹60,000 each. On one, he gained 20% while on the other he lost 20%. Find the percentage of his gain or loss.
SSC CPO 05/10/2023 (Shift-2)
(a) No profit and no loss
(b) 4% Loss
(c) 2% Loss (d) 4% Profit

102. Pradeep sells two fans at 480 each and by doing so he gains 20% on one fan and loses 20% on the other. His loss on the whole (in) is:
SSC CHSL 08/07/2024 (Shift-03)
(a) 30 (b) 10
(c) 20 (d) 40

103. A merchant sold two refrigerators for ₹10,000 each. On one refrigerator, he incurred a 20% loss, and on the other, he gained 20%. What was his profit/loss percentage on the whole transaction?
SSC CHSL 02/07/2024 (Shift-01)
(a) Profit of 4% (b) Loss of 2%
(c) Loss of 4% (d) Profit of 2%

104. A person bought two goods for ₹19,500. He sold one at a loss of 20% and the other at a profit of 15%. If the selling price of each goods is the same, find the cost price of goods sold at profit.
SSC CHSL 17/08/2023 (Shift-03)
(a) ₹11,475 (b) ₹9,750
(c) ₹11,500 (d) ₹8,000

105. A person bought two buffaloes for ₹11,520. One is sold at a loss of 15% and the other is sold at a gain of 19%. If the selling price of both buffaloes is equal, find the cost price of the first one.
SSC CPO 29/06/2024 (Shift-02)
(a) ₹6,700 (b) ₹6,715
(c) ₹6,720 (d) ₹6,710

106. A shopkeeper sold 3 wristwatches for ₹2,800 each. If he has sold the watches with 40%, 25% and 12% profit, respectively, then find his overall profit percentage (correct to 2 decimal places).
SSC CPO 29/06/2024 (Shift-03)
(a) 24.19 (b) 24.63
(c) 24.55 (d) 24.75

107. Two articles were sold for ₹3,000 each, with no loss and profit in the entire transaction. If one was sold at a profit of 25%, then the loss incurred on the second article is ____.
SSC Phase-XII 21/06/2024 (Shift-02)
(a) 10% (b) $18\frac{2}{3}\%$
(c) $16\frac{2}{3}\%$ (d) $15\frac{2}{3}\%$

108. A person sold two items selling each for ₹42,600. On the first item. He made a loss of 25% while on the second, he gained 20%. Find his overall percentage gain or loss, (giving your answer correct to one place of decimal.)
SSC CHSL 10/08/2023 (Shift-01)
(a) 7.7% gain (b) 7.7% loss
(c) 8.3% loss (d) 8.2% loss

109. Both A and B sells their watch at the rate of ₹5,400 per watch. A earned a profit of 10 percent while B incurred a loss of 25 percent. What is the ratio of cost prices of A and B?
SSC CHSL 15/03/2023 (Shift-02)
(a) 19 : 23 (b) 15 : 22
(c) 15 : 19 (d) 18 : 25

110. Manoj bought two T.V. for ₹2,280. He sold one at a loss of 20 percent and other at a profit of 10 percent. If each T.V. was sold for the same price, then what is the cost price of the T.V which was sold at loss?
SSC CHSL 16/03/2023 (Shift-01)
(a) ₹1,380 (b) ₹1,320
(c) ₹1,050 (d) ₹1,440

111. A man sells two cows for ₹15,640 each, gaining 15% on one and losing 15% on the other. Find his total gain or loss.
SSC CGL 09/12/2022 (Shift-04)
(a) ₹720 loss (b) ₹360 loss
(c) ₹720 gain (d) ₹360 gain

112. The selling prices of articles A and B are the same. A is sold at a profit of 28 percent and B is sold at a loss of 24 percent. If the total selling price of the both articles is ₹48640, then what is the cost price of A and B, respectively?
SSC CGL TIER-II (08/08/2022)
(a) ₹26000, ₹40000
(b) ₹17000, ₹28000
(c) ₹19000, ₹32000
(d) ₹24000, ₹38000

113. Aditya sells two wrist watches from his personal collection for ₹12,600 each. On the first watch, he gains 26% and, on the second, he loses 10%. Find the overall gain or loss percentage.
SSC CGL 12/04/2022 (Shift-03)
(a) Gain of 16% (b) Gain of 5%
(c) Loss of 5% (d) Gain of 12%

114. A man buys two watches 'A' and 'B' at a total cost of ₹800. He sells both watches at the same selling price, and earn a profit of 18% on watch 'A' and incurs a loss of 22% on watch 'B'. What are the cost prices of the two watches? (two place after decimal).
SSC CHSL 07/03/2020 (Shift-01)
(a) A = ₹350.32 and B = ₹450.68
(b) A = ₹318.37 and B = ₹481.63
(c) A = ₹220 and B = ₹580
(d) A = ₹ 317 and B = 483

115. A man sold two gifts at ₹30 each. On one gift he gained 18%, and on the other gift he lost 18%. What is his overall gain/loss (in ₹) ?
SSC CHSL 07/03/2020 (Shift-02)
(a) Loss of ₹2.00 (b) Gain of ₹2.00
(c) Loss of ₹2.50 (d) Gain of ₹1.75

◆ TYPE – X ◆
CP OF 1st ARTICLE = SP OF 2nd ARTICLE

116. A shopkeeper sold two items. The selling price of the first item equals the cost price of the second item. He sold the first item a profit of 20% and the second item at a loss of 10%. What is his overall profit/loss percent?
SSC CGL 20/08/2021(Shift 02)
(a) Loss $4\frac{6}{11}\%$ (b) Profit $3\frac{7}{11}\%$
(c) Profit $4\frac{6}{11}\%$ (d) Loss $8\frac{1}{3}\%$

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◆ TYPE – XI ◆
DISHONEST SHOPKEEPER

117. A dishonest dealer decided to sell his goods at cost price, but uses a weight of 960 grams for a kilogram weight. His gain percent is.

SSC Phase-X 04/08/2022 (Shift- 03)

(a) $4\frac{1}{6}\%$ (b) $2\frac{1}{4}\%$
(c) $1\frac{1}{4}\%$ (d) $3\frac{1}{6}\%$

118. A dishonest dealer announces selling his articles with 22% loss, but uses 35% lighter weights. What is the percentage of his profit or loss?

SSC CPO 03/10/2023 (Shift-01)

(a) 13% loss (b) 20% profit
(c) 20% loss (d) 13% profit

119. A dishonest trader marks up his goods by 50% and then allows a discount of 20% on its marked price. Additionally, he uses a faulty scale which measures 900 gm. for 1 kg. shows. What will be his net profit percentage (rounded off to the nearest integer)?

SSC CGL TIER- II 06/03/2023

(a) 33 (b) 36
(c) 27 (d) 24

120. A grocer professes to sell rice at the cost price, but uses a fake weight of 870 gm for 1 kg. Find his profit percentage (correct to two decimal places).

SSC CGL 09/09/2024 (Shift-01)

(a) 15.11% (b) 14.94%
(c) 18.21% (d) 11.11%

121. A dishonest shopkeeper claims to sell salt at a rate of ₹25/kg. The cost price of the salt is ₹25/kg. Not satisfied with this, he tries to make profit by removing 200 gm from each 1 kg. What is the shopkeeper's gain percentage?

SSC CGL 09/09/2024 (Shift-03)

(a) 15% (b) 25%
(c) 30% (d) 20%

122. A dishonest merchant sells his grocery using weights that are 12% less than the true weights and marked the price 10% above. Find his total gain percentage.

SSC CGL 11/09/2024 (Shift-01)

(a) 10% (b) 20%
(c) 15% (d) 25%

123. Ramesh sells rice at ₹36 per kg, which he purchased for ₹30 per kg. Moreover, he gives only 800 gm of rice instead of 1 kg while selling. Find the actual profit percentage of Ramesh.

SSC CGL 13/09/2024 (Shift-02)

(a) 46% (b) 50%
(c) 48% (d) 52%

124. A dishonest fruit-seller sells fruits at 20% profit but he uses 950 gm weight in place of 1 kg. What is the profit percent?

SSC CGL 13/09/2024 (Shift-03)

(a) $\frac{500}{17}\%$ (b) $\frac{500}{19}\%$
(c) $\frac{500}{32}\%$ (d) $\frac{700}{19}\%$

125. A seller sold 19 cookies for ₹95 instead of 20 cookies in 1 kg, cheating a customer. What is the gain (in ₹) if the seller bought the cookies for ₹76?

SSC CGL 18/09/2024 (Shift-03)

(a) 28.2 (b) 26.2
(c) 22.8 (d) 25.8

126. A vendor started selling vegetables at Rs.10 per kg, but couldn't find buyers at this rate. So he reduced the price to Rs.7.2 per kg, but uses a faulty weight of 900 gm instead of 1 kg. Find the percentage change in the actual price.

SSC CGL 19/09/2024 (Shift-01)

(a) 10% (b) 15%
(c) 20% (d) 25%

127. A shopkeeper sells rice at the rate of ₹44 per kg whose cost price is ₹40 per kg. Not satisfied with this, he tries to increase his profit by removing 200 grams of rice from each packet. What is the shopkeeper's overall gain percentage?

SSC CGL 19/09/2024 (Shift-02)

(a) 35% (b) 37.5%
(c) 37% (d) 35.5%

128. A shopkeeper has a fault of 100 gm in a 3 kg weight. He sold 3 kg of potatoes to Charu using the same faulty weight for Rs.46. The cost price of the potatoes for the seller was Rs.12 per kg. How much profit (in Rs.) did he earn on the potatoes?

SSC CGL 26/09/2024 (Shift-03)

(a) 11.6 (b) 10.2
(c) 11.2 (d) 10

129. A shopkeeper cheats 25% in weight while buying rice and cheats 25% while selling it. If he sells the rice at 12.5% profit, then find his net profit percentage.

SSC CHSL 05/07/2024 (Shift-04)

(a) 82.5% (b) 62.5%
(c) 87.5% (d) 92.5%

130. A vendor sells his goods using weights 19% less than true weights and makes a profit of 35%. His net gain percentage (rounded off to 2 decimal places) is:

SSC CHSL 10/07/2024 (Shift-01)

(a) 66.67% (b) 66.33%
(c) 81.33% (d) 81.67%

131. Ravi sells his goods at a 25% loss on cost price but uses 45% less weight. What is his percentage profit or loss?

SSC CHSL 01/07/2024 (Shift-02)

(a) Profit, $47\frac{9}{10}\%$
(b) Loss, $36\frac{4}{11}\%$
(c) Loss, $47\frac{9}{10}\%$
(d) Profit, $36\frac{4}{11}\%$

132. A shopkeeper sells goods at 40% loss on cost price but uses 25% less weight. What is his percentage profit or loss?

SSC CHSL 11/07/2024 (Shift-01)

(a) Profit, 20% (b) Loss, 10%
(c) Loss, 20% (d) Profit, 10%

133. A dishonest dealer professes to sell his goods at the cost price, but he uses a false weight of 850 grams per 1 kg weight. Find the percentage of his gain. (Correct up to two decimal places)

SSC CHSL 09/07/2024 (Shift-02)

(a) 17.65% (b) 17.54%
(c) 17.56% (d) 17.45%

134. A dishonest dealer sells his goods at 20% loss on the cost price but uses a faulty weight that weighs 25% less. His profit or loss percentage (rounded off to 2 decimal places) is:

SSC CPO 27/06/2024 (Shift-03)

(a) 6.67%, loss
(b) 3.33%, profit
(c) 3.33%, loss
(d) 6.67%, profit

135. A dishonest dealer professes to sell his goods at cost price but uses a false weight of 950 grams instead of 1 kilogram. His gain percentage is:

SSC CPO 28/06/2024 (Shift-02)

(a) $4\frac{5}{19}\%$ (b) $6\frac{5}{19}\%$
(c) $5\frac{5}{19}\%$ (d) $7\frac{5}{19}\%$

136. A trader sells pulses at a 32% profit and uses weights 20% less than the actual measure. Find his gain percentage.

SSC CPO 28/06/2024 (Shift-03)

(a) 65% (b) 58%
(c) 72% (d) 62%

137. A dishonest dealer sells an article at a 10% loss on the cost price but uses a weight of 40 gm instead of 50 gm. What is his percentage of profit?

SSC CPO 29/06/2024 (Shift-02)

(a) 12.5% (b) 11.5%
(c) 10.0% (d) 18.4%

138. A dishonest dealer claims to sell his products at 24% loss on the cost price but uses 100 gm weight instead of 200 gm weight. His profit percentage is:

SSC CPO 29/06/2024 (Shift-03)

(a) 52% (b) 40%
(c) 48% (d) 55%

139. A shopkeeper sells goods at 82% loss on cost price but uses 28% less weight. What is his percentage profit or loss?

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 54% loss (b) 54% profit
(c) 75% profit (d) 75% loss

140. A shopkeeper purchased groundnuts at ₹64/kg and sells at ₹80/kg. While selling, he uses faulty weights and gives 800 gm instead of 1 kg. Find his actual profit percentage.

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 32.25% (b) 28.75%
(c) 36.65% (d) 56.25%

141. A dishonest dealer professes to sell grains at cost price, but he uses a weight of 925 g for 1 kg weight. Find his gain percentage. (Approximate to two decimals.)

SSC Phase-XII 26/06/2024 (Shift-03)

(a) 8.11 (b) 7.75
(c) 8.50 (d) 7.50

142. A dishonest shopkeeper sells goods to a customer at a profit of T % over the cost price and also weighs 800g instead of 1kg. His total profit percentage is 40%. What is the value of T?

SSC GD 08/02/2023 (Shift-04)

(a) 40 (b) 24
(c) 10 (d) 12

143. A shopkeeper claims to sell 450 kg rice at a cost price of ₹40/kg but uses a weight of 900 grams instead of a 1 kg weight. He makes a profit of ₹2,520 by selling the remaining rice in the black market. The ratio of the black-market price to the original price per kg of rice is:

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 9 : 4 (b) 4 : 3
(c) 10 : 7 (d) 7 : 5

144. A shopkeeper normally makes a profit of 20% in a certain transaction; he weighed 900 gm instead of 1 kg due to an error in the weighing machine. If he charges 15% less than what he normally charges, then what is his actual profit or loss percentage?

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 18.33% Profit (b) 13.33% Profit
(c) 13.33% Loss (d) 18.00% Loss

145. Sohan sells sugar at cost price but he uses faulty weight and thus earns a profit of 28%. How many g (grams) of sugar is he giving in exchange of 3.2 kg of sugar?

SSC CHSL TIER-II 10/01/2024 (Shift-01)

(a) 1900 (b) 1500
(c) 2500 (d) 2200

146. A dishonest shopkeeper sells rice at a cost price but makes a 25% profit by using faulty weights. He decides to give a discount to attract more customers. What percent of discount should he offer to make 10% profit?

SSC CHSL TIER-II 02/11/2023 (Shift- 01)

(a) 9% (b) 11%
(c) 10% (d) 12%

147. B purchased 15 kg apples at the rate of ₹180 per kg from a wholesaler who uses a weight of 950 grams for the kg weight. B sold all these apples at ₹180 per kg but used a weight of 750 grams for the kg weight. Find the percentage profit earned by B in the transaction (correct to 2 places of decimal).

SSC CGL TIER-II 26/10/2023

(a) 25.75% (b) 26.67%
(c) 22.55% (d) 33.33%

148. The cost price of pulses is 12% less than the selling price. Using a faulty weighing machine, shopkeeper is able to earn 25% profit. How much percent of the faulty machine shows more weight as compared to the actual weight (Rounded off to the nearest integer)?

SSC CPO 04/10/2023 (Shift-03)

(a) 10% (b) 14%
(c) 13% (d) 15%

149. A shopkeeper sells sugar at ₹40 per kg, which he purchased at ₹36 per kg. His weighing machine is faulty and it weighs only 800 gm while selling. His percentage profit (correct to 2 decimal places) is:

SSC CPO 05/10/2023 (Shift-03)

(a) 40% (b) 37.58%
(c) 38.89% (d) 39.28%

150. A dishonest shopkeeper professes to sell grains at the cost price, but he uses a weight of 920 gm for 1 kg weight. Find his gain percentage (round up to two decimal places).

SSC CHSL 02/08/2023 (Shift-01)

(a) 7.90% (b) 8.70%
(c) 8.50% (d) 7.80%

151. A tailor buys lining clothes from a wholesale merchant and cheats him by using a measurement tape which is 5 cm longer than the normal tape. The tailor offer the customer at cost price while stitching different garments and uses measurement tape which is 5 cm shorter than the normal tape . The gain percent is:

SSC CHSL 03/08/2023 (Shift-03)

(a) 15% (b) $10\frac{10}{25}\%$
(c) 10% (d) $10\frac{10}{19}\%$

152. A man sells rice at 8% profit and uses weight 25% less than the actual measure. What is his percentage profit?

SSC CHSL 09/08/2023 (Shift-04)

(a) 44% (b) 41%
(c) 23% (d) 36%

153. A shopkeeper does a faulty weighing of an item of 930 gram instead of 1 kg and sells it at its cost price. Find his profit percentage on selling 15 kg of the item.

SSC CHSL 11/08/2023 (Shift-01)

(a) $8\frac{79}{93}\%$ (b) $5\frac{21}{93}\%$
(c) $7\frac{49}{93}\%$ (d) $6\frac{19}{93}\%$

154. A shopkeeper uses 940 gm weight in place of one kg weight. He sells it at 4% profit. What will be the actual profit percentage? (rounded off to two decimal places)

SSC CGL 14/07/2023 (Shift-02)

(a) 9.25% (b) 10.32%
(c) 10.64% (d) 10.96%

155. The cost price and selling price of rice are the same. Due to a faulty weighing machine, the seller earns a 15% profit. If ₹x is the cost price of 1000 gm rice and the machine is changed which shows 1000 gm instead of 950 gm, what should be the selling price (in ₹) now to get the same percentage of profit?

SSC CGL 20/07/2023 (Shift-04)

(a) 1.0295x (b) 1.0259x
(c) 1.0925x (d) 1.0950x

156. R's weighing machine shows 400 gm when the actual weight is 350 gm. The cost price of almonds is ₹880 per kg and packets of 200 gm are made using the faulty machine. What should be the selling price (in ₹) of each packet to get a profit of 25%?

SSC CGL 26/07/2023 (Shift-01)

(a) 197.50 (b) 175.50
(c) 182.50 (d) 192.50

157. A dishonest dealer sells articles at 15% loss on cost price but uses the weight of 20 gm instead of 25 gm. What is his profit or loss percentage?

SSC CGL 27/07/2023 (Shift-02)

(a) 6.25% Profit (b) 6.50% Profit
(c) 7.55% Loss (d) 5.25% Loss

158. In a grocery shop, Samarth sold 950 g of sugar to a customer in place of 1 kg for ₹54. The cost price of 1 kg sugar was ₹36. How much profit (in ₹) did he earn on selling the sugar?

SSC Phase-XI 30/06/2023 (Shift-04)

(a) 16.2 (b) 18.7
(c) 20.2 (d) 19.8

159. A businessman cheats by using faulty weights, to the tune of 12% each time, when buying and selling material. What is the rise in his profit percentage using faulty weights only?

SSC CGL 05/12/2022 (Shift-03)

(a) 22% (b) 25.44%
(c) 24% (d) 26.32%

160. A faulty weighing machine reads 1 kg when 900 gm is actually weighted on it. The shopkeeper marked the price of his goods by 10%, but unfortunately he was caught by the metrology department and then they ordered him to repair his weighing machine and gave punishment to sell the goods at 10% discount on cost price for a month. If each customer is now paying ₹20 for 1 kg, then before the raid___amount they have paid for same quantity. (Rounded off to two places of decimal)

SSC CPO 09/11/2022 (Shift-01)

(a) ₹27.16 (b) ₹27.84
(c) ₹28.05 (d) ₹28.15

161. A shopkeeper sells his items using a faulty balance which measures 25% less. He then marks up his items 15% above the cost price. If he also gives a discount of 10% then find his net profit percentage on 1 kg items.

SSC CPO 10/11/2022 (Shift-02)

(a) 32%
(b) 41%
(c) 44%
(d) 38%

• TYPE – XII •
CHAR MINAR CONCEPT

162. A man bought an article and sold it at a gain of 10%. If he had bought the article at 20% less and sold it for ₹1,000 more, he would have made a profit of 40%. The cost price of the article (in ₹) is:

SSC CPO 23/11/2020 (Shift-2)

(a) 50,000
(b) 60,000
(c) 25,000
(d) 40,000

163. Anu fixes the selling price of an article at 25% above its cost of production. If the cost of production goes up by 20% and she raises the selling price by 10%, then her percentage profit is (correct to one decimal place):

SSC CGL 03/03/2020 (Shift- 02)

(a) 16.4%
(b) 14.6%
(c) 13.8%
(d) 15.2%

164.. The profit gained on selling a certain product is 320% of the cost. If the cost increases by 10% but the selling price remains constant, then what percentage of the selling price is the profit (correct to one decimal place)?

SSC CGL 12/09/2024 (Shift-03)

(a) 70.2%
(b) 73.8%
(c) 75.7%
(d) 63.8%

165 An article is sold at 10 percent loss. If its cost price is decreased by ₹5 and selling price is increased by ₹8, then profit of 10 percent is earned on it. What is the original selling price of the article?

SSC CHSL 09/03/2023 (Shift-04)

(a) ₹68.5
(b) ₹67.5
(c) ₹62.5
(d) ₹60.75

166. A trader sells an article at 20 percent profit. If he buys it at half of the cost price and sells at the same selling price as before, then what will be the profit percentage?

SSC CHSL 13/03/2023 (Shift-03)

(a) 240%
(b) 40%
(c) 140%
(d) 60%

167. A man earns a profit of 20 percent by selling a calculator for a certain price. If he sells that calculator at double the price, then what will be the profit percentage ?

SSC CHSL 17/03/2023 (Shift-04)

(a) 140%
(b) 160%
(c) 60%
(d) 120%

168. The initial profit percentage on the sale of an item was 55%. If the cost price of the item went up by 24% but the selling price remained the same, what would be the new profit percentage?

SSC CGL 07/12/2022 (Shift-01)

(a) 36%
(b) 25%
(c) 28%
(d) 33%

169. An article is sold at 25 percent loss. If its cost price is doubled and selling price is increased by ₹660, then there is a profit of 20 percent. What is the original cost price of the article?

SSC CGL TIER-II (08/08/2022)

(a) ₹360
(b) ₹500
(c) ₹480
(d) ₹400

170. A person sells an article for a loss of 18 percent. If he increases the selling price by ₹144 and decreases the cost price by 30 percent, then there is profit of 20 percent. What is the original selling price?

SSC CGL TIER-II (08/08/2022)

(a) ₹6036
(b) ₹5904
(c) ₹6124
(d) ₹5068

171. An article is sold at a certain price. If it is sold at 70% of this price, then there is a loss of 10%. What is the percentage profit, when it is sold at the original selling price?

SSC CGL 20/04/2022 (Shift-03)

(a) $\frac{200}{7}\%$
(b) $\frac{300}{7}\%$
(c) $\frac{50}{7}\%$
(d) $\frac{100}{7}\%$

172. An article is sold at a profit of 25%. If both the cost price and the selling price of the article are increased by ₹200, then the profit percentage is 20%. What is the original cost price of the article?

SSC MTS 08/10/2021 (Shift- 02)

(a) ₹750
(b) ₹900
(c) ₹800
(d) ₹840

173. A person sold an article at a loss of 16%. Had he sold it for ₹660 more, he would have gained 8%. What should be the selling price (in ₹) to gain a profit of 12%?

SSC CPO 23/11/2020 (Shift-1)

(a) 3,080
(b) 3,200
(c) 2,750
(d) 2,970

• TYPE – XIII •
BASED ON ALLIGATION

174. A merchant has 1000 kg of sugar, part of which he sells at a 10% profit and the rest at a 40% profit. He gains 20% on the whole. The quantity sold at 40% profit is:

SSC CGL 10/09/2024 (Shift-02)

(a) $543\frac{1}{3}$ kg
(b) $383\frac{1}{3}$ kg
(c) $333\frac{1}{3}$ kg
(d) $443\frac{1}{3}$ kg

175. Ramendra purchased some watermelons for ₹1,500. He sold one-fourth of them at a loss of 12%. At what gain percentage should the remaining watermelons be sold so as to gain 25% on the whole transaction (correct to two decimal places) ?

SSC CHSL 05/07/2024 (Shift-02)

(a) 37.33%
(b) 33.73%
(c) 37.65%
(d) 33.43%

176. The cost price of two articles is equal. One article is sold at a profit of 12% and the other article for ₹3,600 more than the first. If the net profit is $15\frac{27}{51}\%$, then what is the cost price of each article?

SSC CPO 29/06/2024 (Shift-01)

(a) ₹50,000
(b) ₹51,000
(c) ₹50,990
(d) ₹52,150

177. Reyan purchased a laptop for ₹56,000 and a scanner-cum-printer for ₹22,000. He sold the laptop for a 20% profit and the scanner-cum-printer for a 15% profit. What is his profit percentage?

SSC Phase-XII 20/06/2024 (Shift-03)

(a) $18\frac{21}{37}\%$
(b) $18\frac{23}{39}\%$
(c) $12\frac{23}{39}\%$
(d) $12\frac{21}{37}\%$

178. Arvind has 650 kg of wheat. A part of which he sells at 9% profit and the rest at 19% profit to get 15% profit on the whole. What is the quantity (in kg) of wheat sold by Arvind at 9% profit?

SSC CPO 05/10/2023 (Shift-02)

(a) 260 kg
(b) 390 kg
(c) 195 kg
(d) 455 kg

179. A medical store owner purchased medicines worth ₹18,000 from a company. He sold $\frac{2}{5}$ part of the medicine at a 35% loss. On which gain, he should sell the rest of the medicines so that he has neither gain nor loss?

SSC MTS 13/09/2023 (Shift- 02)

(a) $23\frac{1}{3}\%$
(b) $20\frac{2}{3}\%$
(c) $23\frac{2}{3}\%$
(d) $20\frac{1}{3}\%$

180. Shivam purchased two watches, first for ₹ 12000 and the second for ₹10000. He sold both the watches, first one at the profit of 10% and the second at a loss of 10%. What is the overall profit or loss?

SSC MTS 19/05/2023 (SHIFT-01)

(a) 2.25 percent profit
(b) 2.25 percent loss
(c) 0.909 percent profit
(d) 0.909 percent loss

181. Ram purchases two watches for ₹3500. By selling one watch at a profit of 25% and the other at a loss of 10% he neither earns profit nor suffers loss in the whole transaction. What is the cost price of each watch?

SSC CHSL 09/03/2023 (Shift-03)

(a) ₹1500 and ₹2000
(b) ₹1500 and ₹1720
(c) ₹1000 and ₹2500
(d) ₹1250 and ₹2250

182. A shopkeeper earns 10% on an investment but loses 20% on another investment. If the ratio of the two investments is 2 : 3, then the combined loss percentage is:

SSC CGL 05/12/2022 (Shift-02)

(a) 5.5%
(b) 7%
(c) 6%
(d) 8%

183. A shopkeeper has 2220 kg of rice. A part of which he sells at a 20% profit and the rest at a 12% profit. He gains 18% on the whole. The quantity (in kg) sold at a 12% profit is:

SSC CGL 06/12/2022 (Shift-02)

(a) 555
(b) 1210
(c) 1665
(d) 425

184. Ramesh purchases a table and a chair for ₹3,900. He sells the table at a profit of 8% and the chair at a profit of 16%. He earns a profit of ₹540. What is the difference between the original price of the table and the chair?

SSC CGL 13/12/2022 (Shift-01)

(a) ₹2,00
(b) ₹1,800
(c) ₹1,900
(d) ₹1,700

185. A bought a bag and a bottle for a total of ₹900. He sold the bottle at a profit of 12% and the bag at a profit of 20%. If he earned a total profit of ₹160.80, then calculate the cost price of the bottle.

SSC MTS 07/07/2022 (Shift-01)

(a) ₹320
(b) ₹300
(c) ₹200
(d) ₹240

186. A trader bought 640 kg of rice. He sold a part of the rice at 20% profit and the rest at 5% loss. He earned a profit of 15% in the entire transaction. What is the ratio of the quantity of rice that he sold at a loss of 5% to that of the quantity that he sold at a profit of 20%?

SSC CGL TIER-II 03/02/2022

(a) 1 : 3
(b) 4 : 1
(c) 1 : 4
(d) 3 : 1

187. Sushma bought 6 tables and 12 chairs for ₹12,000. She sold the tables at a profit of 15% and the chairs at a loss of 10%. If her total gain was ₹300, then the total cost of the tables was:

SSC CGL 07/06/2019 (Shift-01)

(a) ₹6000
(b) ₹5000
(c) ₹5400
(d) ₹4800

188 A person buys 5 tables and 9 chairs for ₹15,400. He sells the tables at 10% profit and chairs at 20% profit. If his total profit on selling all the tables and chairs is ₹2,080, what is the cost price of 3 chairs?

SSC CHSL 04/03/2020 (Shift-01)

(a) ₹1890
(b) ₹1740
(c) ₹1800
(d) ₹1860

◆ TYPE – XIV ◆
QUESTIONS BASED ON

$$\frac{P_1}{Q_1 \times (100 \pm P_1 / L_1)\%} = \frac{P_2}{Q_2 \times (100 \pm P_2 / L_2)\%}$$

189. By selling 90 ball pens for ₹160 a person losses 20%. The number of ball pens, which should be sold for ₹96 so as to have a profit of 20% is

(a) 36
(b) 37
(c) 46
(d) 47

190. A person bought 7 apples for ₹3. At what price he should sell 100 apples to get the profit of 33%.

(a) 56
(b) 57
(c) 58
(d) 59

191. By selling 3 dozen oranges for ₹405, a trader losses 25% How many oranges should he sell for ₹288 if he needs to earn a profit of 20% in the transaction?

SSC CHSL 04/08/2021 (Shift- 03)

(a) 16
(b) 15
(c) 18
(d) 12

192. By selling 32 oranges in one rupee, a man losses 40%. How many for one rupee should he sell in order to gain 20% ?

(a) 12
(b) 16
(c) 20
(d) 24

193. After selling 4 article for ₹1 a person incurred loss of 4% if he had sold 3 articles for ₹1 his profit percentage would be ?

(a) 24
(b) 28
(c) 32
(d) 36

194. On selling 70 articles for ₹160 a person incurred loss of 20%. How many articles he should sell for ₹ 96 to earn profit of 20%.

(a) 24
(b) 28
(c) 36
(d) 40

195. By selling 18 table fans for ₹11,664 a man incurs a loss of 10%. How many fans should be sell for ₹17,424 to earn 10% profit?

SSC CGL 07/03/2020 (Shift- 01)

(a) 23
(b) 18
(c) 20
(d) 22

◆ TYPE – XV ◆
MISCELLANEOUS QUESTIONS

196. A sells a watch to B at 33% profit and B sells it to C at 20% loss. If C paid ₹532, what was the purchase price for A?

SSC CHSL TIER-II 10/01/2024

(a) ₹800
(b) ₹500
(c) ₹400
(d) ₹600

197. A sells an object to B at 10% profit, B sells it to C at 60% profit and C sells it to D at $12\frac{1}{2}\%$ profit. If D paid ₹59.40, then at what price did A buy it?

SSC CHSL 08/07/2024 (Shift-04)

(a) ₹30
(b) ₹32
(c) ₹28
(d) ₹34

198. A sells a bike to B at 45% profit. Then B sells it to C at 30% profit. If C pays ₹43,355, then what is the cost price of the bike for A?

SSC CHSL 03/07/2024 (Shift-02)

(a) ₹29,000
(b) ₹23,000
(c) ₹27,000
(d) ₹21,000

199. P sells a Laptop to Q at a loss of 25% and Q sells the laptop to R at a profit of 20%. If R purchased the laptop for ₹22,500, then what was the cost (in ₹) of the laptop for P?

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 25000
(b) 24800
(c) 23200
(d) 23800

200. Praveen sells a study table to Zoya at a loss of 10%, and Zoya sells the study table to Aadarsh at a profit of 25%. If Aadarsh purchased the study table for ₹2,250, then what was the cost (in ₹) of the study table for Praveen?

SSC MTS 14/09/2023 (Shift- 02)

(a) 2,100
(b) 1,800
(c) 2,000
(d) 1,900

201. Akash sold a motorcycle to Navin at a profit of 10%. Navin sold it to Vinay at a profit of 20%. Vinay sold it to Vishal at a loss of 5%. If Vishal paid ₹62,700 for the motorcycle, then what was the cost of the motorcycle (in ₹) for Akash?

SSC CHSL 17/08/2023 (Shift-04)

(a) 48,000
(b) 49,000
(c) 47,000
(d) 50,000

202. A sold an article to B at 25% profit and B further sold it to C by earning a certain profit. If the cost price of C is 30% more than the cost price of A, then find the profit percentage earned by B.

SSC CGL 21/07/2023 (Shift-01)

(a) $5\frac{1}{2}\%$
(b) 4%
(c) 5
(d) $4\frac{1}{2}\%$

203. A tea seller used to make 50% of profit by selling tea at ₹9 per cup. When the cost of ingredients increased by 25%, he started selling tea at ₹10 per cup. What is his profit percentage now?

SSC CGL 13/04/2022 (Shift- 01)

(a) $33\frac{2}{3}$
(b) 25
(c) $33\frac{1}{3}$
(d) 30

204. Aditya buys 300 mangoes for ₹1,100. Some of these mangoes are rotten and are thrown away. He sells the remaining mangoes at ₹5 each and makes a profit of ₹150. Find the percentage of mangoes thrown away.

SSC CGL 19/07/2023 (Shift-04)

(a) $16\frac{1}{2}\%$ (b) $15\frac{2}{3}\%$

(c) $16\frac{2}{3}\%$ (d) $16\frac{1}{3}\%$

205. The cost of manufacturing an item was ₹24,000, and 20% of it was spent on packaging and its shipment to a retailer. The manufacturer made a profit of 50%, while the retailer incurred a loss of 20% on selling it to a customer. At what price (in ₹) was the item sold by the retailer?

SSC MTS 05/10/2021 (Shift- 02)

(a) 35,268 (b) 34,560

(c) 37,664 (d) 32,400

206. A company buys raw materials for ₹10,000 and manufactures a product that costs an additional ₹5,000 in labour and overhead. The product is sold to a distributor for ₹25,000, who marks it up by 20% and sells it to a retailer. The retailer then marks it up by another 25% and sells it to the end customer. What is the overall percentage profit made by the company, distributor, and retailer combined?

SSC MTS 11/09/2023 (Shift- 03)

(a) 135% (b) 125%

(c) 100% (d) 150%

207. Sukhen purchased some perishable items for sale but 15% of those items could not be sold and went bad. however, Sukhen managed to sell the rest of the items at a price that helped him earn an overall profit of19% At what percentage above the cost price of each item did Sukhen sell each of the items that did NOT go bad?

SSC CHSL 04/08/2023 (Shift-04)

(a) 40% (b) 42%

(c) 34% (d) 36%

208. The cost prices of two articles A and B are in the ratio 4 : 5. While selling these articles, the shopkeeper gains 10% on article A and 20% on article B and the difference in their selling prices is ₹480. The difference in the cost price (in ₹) of articles B and A is:

SSC CGL 12/04/2022 (Shift-02)

(a) 250 (b) 300

(c) 400 (d) 350

209. A costs thrice as much as B. A is sold at a loss of 10% and B is sold at $\frac{5}{4}$ of its own price. If the selling price of A is ₹5,800 more than the selling price of B, then the cost price of A is.

SSC CHSL 10/07/2024 (Shift-04)

(a) ₹4,000 (b) ₹12,000

(c) ₹15,000 (d) ₹9,600

210. The cost prices of two articles A and B are in the ratio 4 : 5. While selling these articles, the shopkeeper gains 10% on article A and 20% profit on article B, and the difference in their selling prices is ₹480. Find 30% of the total cost price (in ₹) of both the articles.

SSC CGL 18/04/2022 (Shift-02)

(a) 1,000 (b) 900

(c) 810 (d) 1,250

211. A wrist watch is sold for ₹1,200 at a profit percent equal to its cost price. Find the cost price of the wrist watch.

SSC CPO 09/11/2022 (Shift-03)

(a) ₹400 (b) ₹250

(c) ₹350 (d) ₹300

212. By selling an article for ₹131.25, a trader gains as much percent as the number representing the cost price of the article. In order to earn 40% profit, at what price (in ₹) should he sell the article?

SSC CGL 18/08/2021 (Shift 02)

(a) 100 (b) 140

(c) 105 (d) 75

213. Madhav purchased an item for ₹42,000 and sold it at a loss of 20%. With that amount, he purchased another item and sold it at a gain of 30%. What is the overall gain (in ₹)?

SSC CGL 09/09/2024 (Shift-02)

(a) 6720 (b) 4200

(c) 1680 (d) 2520

214. If a shopkeeper sells sugar at Rs.44.8 per kg, he is able to make a 12% profit. Due to water seepage, $\frac{1}{5}$ of the sugar is damaged. What should now be the selling price per kg of the rest of the sugar to have a 5% profit?

SSC CGL 17/09/2024 (Shift-01)

(a) Rs.49.5

(b) Rs.52.5

(c) Rs.48.5

(d) Rs.51.5

215. An article passing through two hands is sold at a total profit of 40% of the original cost price. If the first dealer makes a profit of 30%, then the profit percentage made by the second dealer is:

SSC CGL 17/09/2024 (Shift-02)

(a) $8\frac{6}{13}\%$ (b) $6\frac{3}{13}\%$

(c) $7\frac{1}{13}\%$ (d) $7\frac{9}{13}\%$

216. Raman fixes the sale price of his goods at 16% above the cost price. He sells his goods at 12% less than the fixed price. Find the profit percentage correct to two places of decimal.

SSC CGL 26/09/2024 (Shift-02)

(a) 1.07% (b) 2.08%

(c) 0.08% (d) 3.01%

217. Aarav owns a watch worth ₹10,000. He sells it to Bhavin at a profit of 15%. After some days, Bhavin sells it back to Aarav at 15% loss. Find the percentage profit or loss faced by Aarav.

SSC CPO 27/06/2024 (Shift-02)

(a) 17.25% Loss (b) 17.25% Profit

(c) 18.25% Profit (d) 18.75% Loss

218. A reduction of 7.5% in the cost price of a commodity enables a shopkeeper to purchase 15 kg more than what he previously purchased for a sum of ₹7,400. In order to make a profit of 32.5% on the pre-reduction cost price of the commodity, at what price (in ₹) per kg should the commodity be sold?

SSC CPO 28/06/2024 (Shift-01)

(a) 54 (b) 53

(c) 52 (d) 51

219. The price of an item is increased by 15% and then the price is decreased by 12%. What is the effective percentage increase in the price of item?

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 2.2% (b) 3%

(c) 1.2% (d) 1.8%

220. A dealer buys an article listed at ₹250 and gets successive discounts of 12% and 16%. He spends 10% of the cost price on transportation. At what price should he sell the article to earn a profit of 25%? (Correct to two places of decimal)

SSC Phase-XII 26/06/2024 (Shift-02)

(a) ₹274.10 (b) 254.10

(c) ₹244.10 (d) 264.10

221. The first shirt is sold at twice the selling price of the second shirt. The first shirt is sold at 8% profit and the second shirt is sold at a 3% loss. What is the overall percentage profit on the shirts (Rounded off to two decimal place)?

SSC CPO 03/10/2023 (Shift-01)

(a) 4.60% (b) 4.07%

(c) 3.86% (d) 4.86%

222. Sukhvir purchased some perishable items for sale but 30% of those items could not be sold and went bad. However, Sukhvir managed to sell the rest of the items at a price that helped him earn an overall profit of 19%. At what percentage above the cost price of each item purchased by Sukhvir did he sell each of the items that did not go bad?

SSC CPO 03/10/2023 (Shift-02)

(a) 49% (b) 70%

(c) 75% (d) 63%

223. Aditya sold article X at a profit of 23% and article Y at a loss of 13%. He earned a profit of ₹180 in the entire transaction. If article X costs ₹90 less than article Y, then what is the price of article Y (in ₹)?

SSC CPO 03/10/2023 (Shift-03)

(a) 2,007 (b) 2,050

(c) 2,100 (d) 2,020

224. A vendor marked the selling price of a table at ₹5,670 after adding 35% profit to its cost price. Since the sale was very low at this price level, he decided to sell the table with 12% profit. Find the new selling price (in ₹).

SSC CPO 04/10/2023 (Shift-02)

(a) 4,750 (b) 4,608
(c) 4,810 (d) 4,704

225. Ankita sold three toys. The first toy was sold for ₹1,500 at a profit of 25%; the second toy was sold for ₹2,800 at a loss of 50% and the third toy was sold for ₹3,500 at a profit of 25%. Find her total profit or loss percentage.

SSC CPO 05/10/2023 (Shift-03)

(a) 15.25% profit
(b) 18.75% loss
(c) 18.75% profit
(d) 15.25% loss

226. By selling a TV set for ₹16,800, a salesman gains a profit of 20%. If the production cost is increased by 20%, find the new selling price of the set so as to gain 20%.

SSC MTS 04/09/2023 (Shift- 01)

(a) ₹18,160 (b) ₹18,480
(c) ₹20,160 (d) ₹20,480

227. If a man purchases kismis at ₹320/kg and sells it at ₹6 per 25 grams. then his profit/loss percentage is:

SSC CHSL 02/08/2023 (Shift-04)

(a) 20% loss (b) 25% loss
(c) 25% profit (d) 20% profit

228. The market price of cupboard is ₹15,750, which is 50% above its cost price. It is sold at a discount of 40%. What is the profit/loss percentage?

SSC CHSL 03/08/2023 (Shift-03)

(a) Profit, 20%
(b) Loss, 10%
(c) Loss, 20%
(d) Profit, 10%

229. A person purchased ten boxes of grapes at a cost of ₹2,000 per box. Each box contained 20 kg of grapes. He sold each box at the rate of ₹2,500 per box. But on the whole 10 kg of grapes were damaged. Further he paid ₹1,000 as a transport charges. Find his gain or loss.

SSC CHSL 07/08/2023 (Shift-04)

(a) Gain ₹2050
(b) Loss ₹1,000
(c) Gain ₹2,750
(d) Loss ₹1,500

230. A fruit seller buys 480 bananas for ₹1,200. Some of these bananas are rotten and hence they are thrown away. He sells the remaining bananas at ₹3.5 each and makes a profit of ₹396. What is the percentage of bananas thrown away?

SSC CHSL 11/08/2023 (Shift-04)

(a) 6% (b) 4.5%
(c) 5% (d) 4%

231. The marked price of mustard oil is 25% more than its cost price. At what percentage less than the marked price should it be sold to have no profit and no loss?

SSC CGL 14/07/2023 (Shift-01)

(a) 15% (b) 20%
(c) 18% (d) 22%

232. If the selling price of an article is doubled, then the profit becomes four times. What was the original profit percentage?

SSC CGL 17/07/2023 (Shift-04)

(a) 75% (b) 50%
(c) 100% (d) 25%

233. A shopkeeper purchases six small cold drink bottles for ₹100. For how much should he sell one such bottle to get a profit of 20%?

SSC CGL 18/07/2023 (Shift-04)

(a) ₹22 (b) ₹20
(c) ₹21 (d) ₹23

234. Ram bought a cell phone and paid 30% less than its original price. He sold it at 50% profit on the price he had paid. The percentage of profit earned by Ram on the original price was:

SSC CGL 26/07/2023 (Shift-04)

(a) 25% (b) 50%
(c) 15% (d) 5%

235. A shopkeeper is incurring a loss of cost price of 4 pens while selling 20 pens to Ajay. If the shopkeeper had purchased 20 pens at 10% less price and had sold 20 pens to Ajay at 25% more than the selling price, then how much percentage would he have gained (rounded off to 1 decimal place)?

SSC Phase-XI 28/06/2023 (Shift-03)

(a) 8.0 (b) 11.1
(c) 10.0 (d) 12.5

236. A shopkeeper bought articles A and B for a total ₹2,540. He sold A at a gain of 15% and sold B at a loss of 25%. The selling price of A was ₹109 more than that of B. His profit or loss percentage in the entire transaction was (rounded off to one decimal place):

SSC Phase-XI 30/06/2023 (Shift-01)

(a) Loss, 8.3%
(b) Profit, 8.3%
(c) Profit, 9.5%
(d) Loss, 9.5%

237. The cost price of two articles A and B is the same. Article A is sold at a loss of 24% and article B is sold for ₹270 more than the selling price of A. If the net profit by selling both the articles is 12%, then what is the selling price (in ₹) of article B?

SSC PHASE-IX 2022

(a) 645 (b) 555
(c) 575 (d) 610

238. $\frac{2}{5}$ of marked price is equal to $\frac{5}{8}$ of selling price. What is the discount percent?

SSC CHSL 09/03/2023 (Shift-01)

(a) 40% (b) 42%
(c) 36% (d) 50%

239. The cost price of two dozen bananas is ₹30. After selling 15 bananas at ₹12 per dozen, the shopkeeper sells the remaining bananas at ₹5 per dozen. What is the percentage of loss?

SSC CHSL 13/03/2023 (Shift-04)

(a) 22.5% (b) 25%
(c) 37.5% (d) 30%

240. Ritika purchased x kg wheat at ₹30/kg and sold 8 kg of this at ₹x per kg and remaining at ₹45/kg. Overall profit percent earned is 10%, then what quantity of wheat Ritika sold at ₹45/kg ?

SSC CHSL 14/03/2023 (Shift-02)

(a) 18 kg (b) 16 kg
(c) 10 kg (d) 14 kg

241. A man buys a machine for ₹ 5,000. After one year, he sells it for ₹ 6000. After two years, again he buys the same machine at ₹ 8,000 and sells it for ₹10,000. Find his overall profit percentage for both the transactions.

SSC CGL TIER-II 02/03/2023

(a) 20.23% (b) 23.08%
(c) 18.75% (d) 15.23%

242. Products pass successively through the hands of three traders and each of them sells his goods at a profit of 30% of his cost price. If the last trader sold the products for ₹300, then how much did the first trader pay for them?

SSC CGL TIER- II 03/03/2023

(a) ₹330.55 (approx)
(b) ₹136.55 (approx)
(c) ₹240.55 (approx)
(d) ₹137.55 (approx)

243. The price of some wooden furniture increases by 65% when it passes through three hands. If the first and second sellers made a profit of 20% and 25%, respectively, then find the profit percentage of the third seller.

SSC CGL 02/12/2022 (Shift-03)

(a) 10% (b) 12.5%
(c) 16% (d) 8%

244. A Microwave oven is sold in Hyderabad for ₹M. A retailer, Elahi from Hyderabad went to Madras and bought it for 25% less (when compared to the price in Hyderabad). He spends ₹1,000 on transport to bring it from Madras to Hyderabad. He sold it in Hyderabad for ₹M making a profit of 10%. Find the value of M (in ₹).

SSC CGL 12/12/2022 (Shift-01)

(a) 6,305.8 (b) 6,258.8
(c) 6,285.7 (d) 6,527.9

245. What will be the actual profit percentage (rounded off to nearest integer) after selling an article at a certain price, while there occurs a loss of 45% on selling the article at $\frac{3}{8}$ of the selling price?

SSC CPO 09/11/2022 (Shift-03)

(a) 17% (b) 37%
(c) 47% (d) 27%

246. A shopkeeper increases the selling price of an article by 15%. After increasing the selling price, he noticed that the profit percentage changed from 5% to 15%. The percentage increase in the cost price is:

SSC CPO 11/11/2022 (Shift-02)

(a) 20% (b) 10%
(c) 15% (d) 5%

247. P buys an article for ₹280 and sells it to Q at a profit of 25%. Q sells it to R at some profit R sells it to S for ₹560 marking a profit of 40%. What percentage profit (rounded off to the nearest integer) did Q make?

SSC Phase-X 05/08/2022 (Shift- 03)

(a) 32% (b) 20%
(c) 26% (d) 14%

248. Harsh purchased a scooter for ₹48,000. He sold it at a loss of 15%. With that money he purchased another scooter and sold it at a profit of 22.5%. What is his overall loss/profit percentage?

SSC CHSL 26/05/2022 (Shift- 02)

(a) Profit 4.125% (b) Profit 2.25%
(c) Loss 4.125% (d) Loss 2.25%

249. A shopkeeper bought 20 kg of sugar at ₹45 per Kg, 25 Kg of sugar at ₹50 per kg and 35 kg of sugar at ₹40 per kg. He spent a sum of ₹450 on transportation and other expenses. He mixed all the three types of sugar and sold all the stock at ₹52.50 per kg. His profit percent in the entire transaction is:

SSC CGL 17/08/2021(Shift 02)

(a) 5% (b) 7.25%
(c) 4.25% (d) 6.5%

250. The cost price of articles X and Y is the same. Article X is sold at 20% profit and article Y is sold for ₹126 less than the selling price of X. If the net profit by selling both the articles is 14%, then what is the cost price (in ₹) of each article?

SSC PHASE-IX 2022

(a) 1,260 (b) 840
(c) 1,050 (d) 1,080

251. An article is sold at a certain price. If it is sold at $33\frac{1}{3}\%$ of this price, there is a loss of $33\frac{1}{3}\%$. What is the percent profit when it is sold at 60% of the original selling price?

SSC CGL TIER-II 11/09/2019 (Shift-03)

(a) $33\frac{1}{3}\%$ (b) $17\frac{1}{3}\%$
(c) 30% (d) 20%

252. A man sells his goods at a certain price, 20% of which is his profit. If the price at which he buys the goods increases by 10% and he sells then at an 8% higher price, then what will be his profit percent (correct to one decimal place)?

SSC CGL TIER-II 12/09/2019 (Shift-01)

(a) 21.8 (b) 23.4
(c) 21.4 (d) 22.7

253. The marked price of an article is ₹315. It is sold for ₹288. If there is a loss of 4%, then by what percent above the cost is the article marked?

SSC CGL 04/06/2019 (Shift-01)

(a) 5% (b) 8%
(c) $6\frac{1}{2}\%$ (d) $5\frac{1}{2}\%$

SELECTION मंत्र #01

"Calculations take too much time, and I make frequent mistakes!"

#Hacks:-

- Avoid calculator while solving **PYQs** and **Mock Test.**
- **Memorize key values –** Learn Tables (1-30), Squares (1-50), Cubes (1-20), Values of different powers of 2 to 10, Important percentage-to- fraction conversions, equivalent values for successive percentage changes (5%, 10%, 15%, 20%), and values for perimeter & area of a circle with radius 7, etc.
- **Reduce pen usage –** Develop mental calculation skills – Practice solving small additions, subtractions, multiplications, and divisions without writing.
- To learn the best calculation techniques, search for "**Brahmastra Series (Mission 2024) Calculation Videos**" by Aditya Ranjan Sir on YouTube.
- **Daily 10-minute Calculation Drill:**
  - **Multiplication Trick:** 42 × 48 = ?
  - **Squaring Trick:** 47^2 = ?
  - **Percentage to Fraction:** 62.5% = ?
  - **Approximation:** 199 × 201 = ?
  - **Unit Digit Trick:** What is the last digit of 739^2?
- **Master Value Putting in Algebra & Trigonometry –** Instead of solving algebraic expressions traditionally, learn how to substitute values smartly.
- **Use options to solve faster –** Carefully observe the given answer choices and eliminate irrelevant options to save time.

Tip: Speed + Accuracy = Selection!
Practice daily and calculations will feel effortless in the exam!

ANSWER KEY

1.	(c)	2.	(a)	3.	(b)	4.	(c)	5.	(c)	6.	(b)	7.	(c)	8.	(d)	9.	(a)	10.	(c)
11.	(d)	12.	(a)	13.	(b)	14.	(c)	15.	(a)	16.	(c)	17.	(b)	18.	(c)	19.	(d)	20.	(c)
21.	(b)	22.	(d)	23.	(a)	24.	(d)	25.	(b)	26.	(a)	27.	(a)	28.	(a)	29.	(b)	30.	(d)
31.	(a)	32.	(a)	33.	(d)	34.	(b)	35.	(b)	36.	(a)	37.	(a)	38.	(c)	39.	(b)	40.	(a)
41.	(b)	42.	(a)	43.	(a)	44.	(c)	45.	(c)	46.	(b)	47.	(b)	48.	(b)	49.	(d)	50.	(a)
51.	(a)	52.	(b)	53.	(d)	54.	(a)	55.	(c)	56.	(a)	57.	(c)	58.	(d)	59.	(b)	60.	(b)
61.	(d)	62.	(b)	63.	(d)	64.	(b)	65.	(b)	66.	(c)	67.	(c)	68.	(a)	69.	(a)	70.	(a)
71.	(a)	72.	(c)	73.	(c)	74.	(c)	75.	(a)	76.	(d)	77.	(d)	78.	(b)	79.	(c)	80.	(d)
81.	(a)	82.	(d)	83.	(a)	84.	(a)	85.	(d)	86.	(c)	87.	(b)	88.	(d)	89.	(b)	90.	(c)
91.	(d)	92.	(a)	93.	(a)	94.	(a)	95.	(d)	96.	(b)	97.	(c)	98.	(a)	99.	(c)	100.	(b)
101	(b)	102.	(d)	103.	(c)	104.	(d)	105.	(c)	106.	(b)	107.	(c)	108.	(b)	109.	(b)	110.	(b)
111.	(a)	112.	(c)	113.	(b)	114.	(b)	115.	(a)	116.	(b)	117.	(a)	118.	(b)	119.	(a)	120.	(b)
121.	(b)	122.	(d)	123.	(b)	124.	(b)	125.	(c)	126.	(c)	127.	(b)	128.	(c)	129.	(c)	130.	(a)
131.	(d)	132.	(c)	133.	(a)	134.	(d)	135.	(c)	136.	(a)	137.	(a)	138.	(a)	139.	(d)	140.	(d)
141.	(a)	142.	(d)	143.	(d)	144.	(b)	145.	(c)	146.	(d)	147.	(b)	148.	(a)	149.	(c)	150.	(b)
151.	(d)	152.	(a)	153.	(c)	154.	(c)	155.	(c)	156.	(d)	157.	(a)	158.	(d)	159.	(b)	160.	(a)
161.	(d)	162.	(a)	163.	(b)	164.	(b)	165.	(d)	166.	(c)	167.	(a)	168.	(b)	169.	(d)	170.	(b)
171.	(a)	172.	(c)	173.	(a)	174.	(c)	175.	(a)	176.	(b)	177.	(b)	178.	(a)	179.	(a)	180.	(c)
181.	(c)	182.	(d)	183.	(a)	184.	(b)	185.	(d)	186.	(c)	187.	(a)	188.	(c)	189.	(a)	190.	(b)
191.	(a)	192.	(b)	193.	(b)	194.	(b)	195.	(d)	196.	(b)	197.	(a)	198.	(b)	199.	(a)	200.	(c)
201.	(d)	202.	(b)	203.	(c)	204.	(c)	205.	(b)	206.	(d)	207.	(a)	208.	(b)	209.	(b)	210.	(c)
211.	(d)	212.	(c)	213.	(c)	214.	(b)	215.	(d)	216.	(b)	217.	(b)	218.	(b)	219.	(c)	220.	(b)
221.	(b)	222.	(b)	223.	(a)	224.	(d)	225.	(b)	226.	(c)	227.	(b)	228.	(b)	229.	(c)	230.	(c)
231.	(b)	232.	(b)	233.	(b)	234.	(d)	235.	(b)	236.	(a)	237.	(b)	238.	(c)	239.	(c)	240.	(c)
241.	(b)	242.	(b)	243.	(a)	244.	(c)	245.	(c)	246.	(d)	247.	(d)	248.	(a)	249.	(a)	250.	(c)
251.	(d)	252.	(d)	253.	(a)														

SOLUTIONS

CP = cost price SP = selling price
P = Profit L = Loss
D = Discount MP = Mark price

1. (c) Profit = 3500 – 3000 = 500

$$\therefore \text{Profit \%} = \frac{500}{3000} \times 100\%$$

$$= 16.66\%$$

Alternate Method:

$$\frac{SP}{CP} = \frac{3500}{3000} = \frac{7}{6}$$

$$\therefore \text{Profit\%} = \frac{1}{6} \times 100 = 16.66\%$$

2. (a) Here, SP > CP, So gain occurs
Gain = ₹3200 – ₹3000 = ₹200

3. (b) Given,
CP = 625, SP = 550
Loss = CP – SP = 625 – 550 = 75

$$\text{Loss\%} = \frac{\text{Loss}}{CP} \times 100\%$$

$$= \frac{75}{625} \times 100 = 12\%$$

Alternate Method:

$$\underbrace{\begin{matrix} CP & & SP \\ 625 & & 550 \\ 25 & : & 22 \end{matrix}}_{-3}$$

$$\text{Loss \%} = \frac{3}{25} \times 100 = 12\%$$

4. (c) $\text{Loss\%} = \frac{4960-4712}{4960} \times 100$

$$= \frac{2480}{496} = 5\%$$

5. (c) Given,
CP of 10 article is = ₹15
SP of 10 article is = 10 × 1.7 = ₹17

$$\text{Profit\%} = \frac{17-15}{15} \times 100 = 13.33\%$$

6. (b) CP of oven after overheads
= 25000 + 1500 = ₹26500
SP = ₹29500

$$\text{Profit\%} = \frac{\text{Profit}}{CP} \times 100\%$$

$$= \frac{29500-26500}{26500} \times 100\% = 11\%$$

Alternate Method:

CP of oven = 25000 + 1500 = 26500
SP of oven = 29500

$$\underbrace{\begin{matrix} SP & & CP \\ 29500 & & 26500 \\ 59 & : & 53 \end{matrix}}_{6}$$

$$\text{Profit \%} = \frac{6}{53} \times 100$$

$$= 11.32\% \sim 11\% \text{ (Approx)}$$

7. (c)

$$\overset{+250\%}{\overbrace{\begin{matrix} CP & & SP \\ 100 & & 350 \\ 2 & : & 7 \end{matrix}}}$$

CP : SP = 2 : 7

8. (d) Given,
Cost price of HP Printer = ₹4,800
Repair cost = ₹500
Total cost = 4800 + 500 = ₹5,300
S.P. = ₹6,360
Profit = ₹1,060

$$\text{Profit \%} = \frac{1060}{5300} \times 100 = 20\%$$

9. (a) CP = ₹6450, P = 16% & SP = ?

$$SP = \frac{6450}{100}\times 116 = ₹7482$$

Note: Use digital some to avoide the calculation.

Alternate Method:

$$16\% = \frac{4\overset{+}{\leftarrow}}{25}$$

$$\begin{tikzcd} CP & SP \\ 25 \arrow[d, bend right, "258\times"'] & 29 \arrow[d, bend left, "\times 258"] \\ \text{Rs.}6450 & \boxed{\text{Rs.}7482} \end{tikzcd}$$

10. (c) $CP = 8540 \times \frac{100}{122} = 7000$

11. (d) $\frac{\text{CP of Shirt}}{\text{CP of Trouser}} = \frac{1200\times\frac{5}{6}}{660\times\frac{10}{11}} = \frac{5}{3}$

12. (a) C.P = ₹650, Profit = 26%

$$S.P = \frac{650\times 126}{100} = ₹819$$

13. (b) Let the CP of mobile phone is 100 unit

$$\begin{tikzcd} C.P & M.P \\ 100 \arrow[r, "+14\%"] \arrow[d, "\times 160"] & 114 \arrow[d, "\times 160"] \\ \boxed{₹16{,}000} & ₹18{,}240 \end{tikzcd}$$

14. (c) S.P. of oil = ₹336

$P_1 = 12\%$, $P_2 = 9\%$

ATQ.

112% → 336

$$\therefore 109\% \to \frac{336}{112}\times 109 = ₹327$$

15. (a) Let, CP of the car be 100%

125% → 278000

$$118\% \to \frac{278000}{125}\times 118\% = 262432$$

Note:- $\frac{278000}{125}\times 118 = \frac{8}{8}\times 1 = 1$

Digital sum of 262432 = 1

16. (c) $CP \times \frac{67}{100} = 402 \Rightarrow CP = 600$

$$\text{SP at 37\% profit} = 600\times\frac{137}{100} = ₹822$$

Alternate Method:

$$\frac{CP}{MP} = \frac{(100-D)\%}{(100+P)\%}$$

$$\begin{tikzcd} 67 \arrow[d, "\times 6"] & : & 137 \arrow[d, "\times 6"] \\ 402 & & \boxed{822} \end{tikzcd}$$

SMART APPROACH:-

ATQ.

$\Rightarrow \frac{402}{67}\times 137$ [use digital sum method]

$\Rightarrow \frac{6}{4}\times 2 = \frac{3}{4} = \frac{3}{4}\times\frac{7}{7} = 3$ [digital sum]

Now, check which option digital sum is 3.

17. (b) $16\frac{2}{3}\% = \frac{-1 \to L}{6 \to CP_1} \Rightarrow \frac{-2 \to L}{12 \to CP_2}$

$(\because CP_1 = CP_2)$

$\Rightarrow SP_1 = 12 - 2 = 10$ unit

$8\frac{1}{3}\% = \frac{+1 \to P}{12 \to CP_2}$

$\Rightarrow SP_2 = 12 + 1 = 13$ unit

$SP_1 = ₹480$, $SP_2 = ?$

$$\therefore SP_2 = \frac{480}{10}\times 13 = ₹624$$

Alternate Method:

$$\text{Loss\%} = 16\frac{2}{3}\% = \frac{-1}{6}$$

$$\begin{tikzcd} CP & SP \\ 6 \arrow[d, bend right, "96\times"'] & 5 \arrow[d, bend left, "\times 96"] \\ \boxed{₹576} & ₹480 \end{tikzcd}$$

$$\text{Again, Profit\%} = 8\frac{1}{3}\% = \frac{+1}{12}$$

$$\begin{tikzcd} CP & SP \\ 12 \arrow[d, bend right, "48\times"'] & 13 \arrow[d, bend left, "\times 48"] \\ \text{Rs.}576 & \boxed{₹624} \end{tikzcd}$$

18. (c) Let, CP = 100 units, P% = 10%

$\therefore SP_1$ (110 units) = ₹22,000

$$\therefore SP_2(114\text{ units}) = \frac{22{,}000}{110}\times 114$$

= ₹22,800

19. (d) ₹2200 → 110%

$$₹1 \to \frac{110}{2200}\%$$

$$\therefore ₹2600 \to \frac{110\%}{2200}\times 2600 = 130\%$$

Profit% = 130 − 100 = 30%

20. (c) Let CP = 100%

So, (100% − 28%) = 144

1% = 2

100% = 200

Now,

$$\text{New profit\%} = \frac{288-200}{200}\times 100$$

$$= \frac{88}{200}\times 100 = 44\%$$

Alternate Method:

$$\begin{array}{ccccc} CP & & SP & & \text{New SP} \\ 100_{\times 2} & : & 72_{\times 2} & & \\ & & 144 & : & 288 \\ \hline 200 & : & 144 & : & 288 \end{array}$$

Profit

88

$$\therefore \text{Profit \%} = \frac{88}{200}\times 100 = 44\%$$

21. (b) Let C.P of pen be 100%

166.44 → 114%

$$154.76 \to \frac{114}{16644}\times 15476$$

= 106% ⇒ 6% Profit

22. (d) A.T.Q,

Let CP be 100%

1232 → 224%

$$572 \to \frac{224\%}{1232}\times 572 = 104\%$$

∴ Profit = 4%

23. (a) 4% = (5000 − 4680) = 320

1% = 80

SP at 4% profit

104% = Rs.8320

24. (d) $25\% \to \frac{1}{4}\overset{+}{\leftarrow} = \frac{5 \to SP \xrightarrow{\times 252} 1260}{4 \to CP \xrightarrow{\times 252} 1008}$

$$10\% = \frac{1}{10}\overset{-}{\leftarrow} = \frac{9 \to SP \xrightarrow{\times 160} 1440}{10 \to CP \xrightarrow{\times 160} 1600}$$

Total CP = 1008 + 1600 = 2608

Total SP = 1260 + 1440 = 2700

$$\therefore \text{Profit \%} = \frac{92}{2608}\times 100 = 3\frac{86}{163}\%$$

25. (b)

Let the min^m C.P = 200
max^m S.P = 300
Profit) 100

We take min^m C.P & max^m S.P to max^m profit

Now,

The maximum possible profit for 25 books = 25 × 100 = ₹2500

26. (a)

$$\begin{tikzcd} CP & : & SP & : & \text{New SP} \\ 10{,}000 \arrow[rrrr, bend right, dash] & : & 12{,}000 \arrow[rr, bend right, dash, "-1000"'] & : & 13{,}000 \end{tikzcd}$$

$$\text{Loss\%} = \frac{1000}{10{,}000}\times 100 = 10\%$$

27. (a) Total C.P for Majeet

= 22000 + 3000 = 25000

Decreased in profit %

$$= \frac{500}{25{,}000}\times 100 = 2\%$$

⇒ ₹500 is 2% of C.P

⇒ New profit% = 12 − 2 = 10%

Alternate Method:

$$12\% = \frac{+3}{25}$$

CP of moter bike = 22000 + 3000
= 25000

$$\begin{tikzcd} CP & SP \\ 25 \arrow[d, "\times 1000"] & 28 \arrow[d, "\times 1000"] \\ 25000 & 28000 \end{tikzcd}$$

When, moter bike is sold at 500 less

SP = 28000 − 500 = 27500

$$\text{Profit \%} = \frac{2500}{25000}\times 100 = 10\%$$

28. (a) Cost price of 195 kg of wheat

= 10260 − 195 × 4.50 = Rs. 9382.5

Cost price of 15 kg of wheat

$$= \frac{9382.5}{195}\times 15 = 721.74 \sim \text{Rs.}722$$

29. (b) Selling price of 50 Oranges

= 50 × 0.70 = Rs.35

Total selling price = 46.20 + 35

= Rs.81.20

∴ Loss = 115.20 − 81.20 = Rs.34

30. (d) Total selling price $= 32400\times\frac{120}{100}$

= Rs.38880

Quantity of wheat remaining

$$= 1800\times\frac{4}{5} = 1440\text{ kg}$$

∴ Selling price per kg of wheat

$$= \frac{38880}{1440} = 27$$

31. (a) Selling price = $8000 \times \frac{6}{5} = 9600$
Remaining quantity of cotton
$= 500 \times \frac{9}{10} = 450$ kg
Selling price of remaining cotton per kg $= \frac{9600}{450} = \frac{64}{3} = 21\frac{1}{3}$ Rs/kg

32. (a) Total price of undamaged goods
$= 5000 \times \frac{95}{100} \times \frac{6}{5} = 5700$

33. (d) Let the CP of rice is 100 unit
On 30% profit SP = 130 unit
130 unit = 1400
100 unit - 1076.9
profit = 1076.9 – 700 - 377

Alternate Method:

$30\% = \frac{3}{10}$ $\begin{matrix} \leftarrow \text{Profit} \\ \rightarrow \text{CP} \end{matrix}$
13 unit → ₹1400
10 unit → $\frac{1400}{13} \times 10$
CP = ₹1076.9
Actual CP = ₹700
Transportation charge
= (1076.9 – 700) - 377

34. (b) Given,
Cost price of 20 bags = ₹13000
C.P. of 1 bag = ₹650
S.P. of 15 bags = ₹10,125
S.P. of 1 bag = ₹675
Profit on one bag = 675 – 650 = ₹25
Total number of bags bought for gaining ₹3,225
$= \frac{3225}{25} = 129$

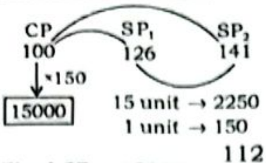
35. (b) Given,
C.P = 95 × 12 × 4.5 = 95 × 54
= 5130
S.P = 88 × 78 = 6864
Profit% $= \frac{6864 - 5130}{5130} \times 100$
= 33.8 - 34% profit

SMART APPROACH:-
-7 Dozen
95×54 : 88×78
855 : 1144
+289
$L\% = \frac{289}{855} \times 100$
L% = 33.8% - 34%

36. (a) 20% profit $= \frac{1}{5}$
⇒ CP = 5 unit, SP = 6 unit
(6 – 5)unit = ₹1800
5 unit = ₹9000
∴ CP = ₹9000

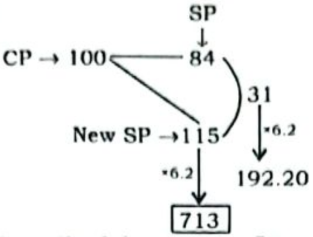
37. (a) (41 – 26)% = 2250
100% = 15000
Selling price $= 15000 \times \frac{112}{100} = 16800$

Alternate Method:-



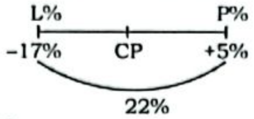
Final SP $= 15000 \times \frac{112}{100} = 16800$

38. (c)



∴ New SP of the article = ₹713.

39. (b)



ATQ,
5% – (–17)% = 1056
CP $= 1056 \times \frac{100}{22} =$ ₹4800

40. (a) Let, CP of article be x
$\Rightarrow x \times \frac{27}{100} - x \times \frac{12}{100} = 900$
$\Rightarrow x \times \frac{15}{100} = 900$
$\Rightarrow x =$ ₹6000

Alternate Method:-

$(27\% - 12\%) = 15\% \rightarrow 900$ (×60)
$100\% \rightarrow 6000$ (×60)

SMART APPROACH:-
CP : SP
100 : 112, 127 → 15 unit
15 unit → 900
100unit → $\frac{900}{15} \times 100$
= 6000

41. (b) $\left(\frac{CP - 210}{CP} - \frac{CP - 420}{CP}\right) \times 100 = 7$
$\Rightarrow \frac{CP - 210 - CP + 420}{CP} \times 100 = 7$
$\Rightarrow \frac{210}{CP} \times 100 = 7 \Rightarrow CP = 3000$

42. (a) ATQ,
28 oranges × CP = 24 oranges × SP
$\Rightarrow \frac{CP}{SP} = \frac{6}{7}$
Profit = 7 – 6 = 1
∴ Profit % $= \frac{1}{6} \times 100\% = 16\frac{2}{3}\%$

Alternate Method:
In such cases, we can directly find
Profit% $= \frac{n_{SP} - n_{CP}}{n_{CP}} \times 100$
$= \frac{28 - 24}{24} \times 100 = \frac{100}{6} = 16\frac{2}{3}\%$

43. (a) ATQ,
S.P × 40 = C.P × 50
$\Rightarrow \frac{S.P}{C.P} = \frac{5}{4}$ +1 $\boxed{P = SP - CP}$
Profit % $= \frac{1}{4} \times 100 = 25\%$

44. (c) ATQ,
SP × 100 = C.P × 140
$\Rightarrow \frac{SP}{CP} = \frac{7}{5}$
Profit = SP – CP = 7 – 5 = 2
∴ Profit % $= \frac{2}{5} \times 100 = 40\%$

Alternate Method:
Profit % $= \frac{n_{CP} - n_{SP}}{n_{SP}} \times 100$
$= \frac{140 - 100}{100} \times 100 = 40\%$

45. (c) 84 SP = 105 CP
$\Rightarrow \frac{SP}{CP} = \frac{105}{84} = \frac{15}{12} \Rightarrow \frac{5}{4}$ +1
Profit % $= \frac{1}{4} \times 100\% = 25\%$

Alternate Method:
Profit % $= \frac{n_{SP} - n_{CP}}{n_{CP}} \times 100$
$= \frac{105 - 84}{84} \times 100 = \frac{1}{4} \times 100\% = 25\%$

46. (b) 80 SP = 72CP
$\Rightarrow \frac{SP}{CP} = \frac{72}{80} = \frac{9}{10}$
∴ Loss % $= \frac{10 - 9}{10} \times 100 = 10\%$

47. (b) ATQ,
30CP = 25SP
$\Rightarrow \frac{CP}{SP} = \frac{25}{30} = \frac{5}{6}$ +1
Profit% $= \frac{1}{5} \times 100 = 20\%$

Alternate Method:
Profit % $= \frac{n_{SP} - n_{CP}}{n_{CP}} \times 100$
$= \frac{30 - 25}{25} \times 100 = \frac{1}{5} \times 100\% = 20\%$

48. (b) 50 × SP = 42 × CP
$\Rightarrow \frac{SP}{CP} = \frac{21}{25}$
Loss% $= \frac{25 - 21}{25} \times 100\% = 16\%$

49. (d) ATQ, 36 CP = N × SP
$\frac{SP}{CP} = \frac{36}{N}$ ....(i)
Now, P% = 20% $= \frac{1}{5}$
$\Rightarrow \frac{SP}{CP} = \frac{6}{5} \times \frac{6}{6}$
$\Rightarrow \frac{SP}{CP} = \frac{36}{30}$ ....(ii)
By (i) and (ii)
N = 30

Alternate Method:

$$\text{Profit \%} = \frac{n_{SP} - n_{CP}}{n_{CP}} \times 100$$

$$\Rightarrow 20 = \frac{36 - N}{N} \times 100$$

$$\Rightarrow \frac{1}{5} = \frac{36 - N}{N}$$

$\Rightarrow N = 180 - 5N \Rightarrow N = 30$

50. (a) $44\% = \frac{44}{100} = \frac{11 \rightarrow P}{25 \rightarrow CP}$

$\therefore SP \rightarrow 25 + 11 = 36$ unit

$36\text{unit} \xrightarrow{\times 15} 540$

$\therefore 25\text{unit} \xrightarrow{\times 15} 375$

51. (a) $CP \times 240 = x \times SP$

$$\Rightarrow \frac{CP}{SP} = \frac{x}{240} \Rightarrow x = \frac{CP}{SP} \times 240$$

$$\Rightarrow x = \frac{100}{120} \times 240 = 200$$

Alternate Method:-

$\text{Profit} = 20\% = \frac{+1}{5}$

$$\begin{array}{cc} 5 & 6 \\ \downarrow \times 40 & \downarrow \times 40 \\ \boxed{200} & 240 \end{array}$$

52. (b) $44CP = xSP$

$$\frac{CP}{SP} = \frac{x}{44}$$

$$\text{Profit} = 10\% = \frac{1}{10}$$

$$\therefore \frac{CP}{SP} = \frac{x}{44} \Rightarrow \frac{10}{11} = \frac{x}{44} \Rightarrow x = 40$$

Alternate Method:

$$\text{Profit} = 10\% = \frac{1}{10}$$

$$\begin{array}{ccc} CP & : & SP \\ 10 & : & 11 \\ \downarrow \times 4 & & \downarrow \times 4 \\ \boxed{40} & & 44 \end{array}$$

53. (d) $70\ CP = 40\ SP$

$$\Rightarrow \frac{CP}{SP} = \frac{4}{7}$$

$$\therefore \text{Profit \%} = \frac{7-4}{4} \times 100 = \frac{300}{4}$$

$= 75\%$

Alternate Method:

$$\text{Profit \%} = \frac{n_{SP} - n_{CP}}{n_{CP}} \times 100$$

$$= \frac{70 - 40}{40} \times 100 = \frac{300}{4} = 75\%$$

54. (a) $42\ SP - 42\ CP = 7\ SP$

$\Rightarrow 35\ SP = 42\ CP$

$$\Rightarrow \frac{SP}{CP} = \frac{6}{5} \quad +1$$

$$\text{Profit \%} = \frac{1}{5} \times 100 = 20\%$$

55. (c) Profit = SP – CP

$\Rightarrow 12SP = 60SP - 60CP$

$\Rightarrow 60CP = 48SP$

$$\Rightarrow \frac{CP}{SP} = \frac{4}{5}$$

$$\therefore \text{Profit \%} = \frac{5-4}{4} \times 100 = 25\%$$

56. (a) Profit = SP – CP

$\Rightarrow 6\ SP = 22\ SP - 22\ CP$

$$\Rightarrow 22\ CP = 16\ SP \Rightarrow \frac{CP}{SP} = \frac{8}{11}$$

$$\therefore \text{Profit\%} = \frac{11-8}{8} \times 100 = 37\frac{1}{2}\%$$

57. (c) $17\ CP = 8(CP + SP)$

$\Rightarrow 17\ CP - 8\ CP = 8SP$

$\Rightarrow 9\ CP = 8SP$

$$\Rightarrow \frac{CP}{SP} = \frac{8}{9}$$

$$\therefore \text{Profit \%} = \frac{1}{8} \times 100 = 12.5\%$$

58. (d) $2SP - 2CP = 3CP$

$\Rightarrow 2SP = 5CP$

$$\Rightarrow \frac{SP}{CP} = \frac{5}{2}$$

Profit = 5 – 2 = 3

$$\therefore \text{Profit \%} = \frac{3}{2} \times 100 = 150\%$$

59. (b) Profit = Selling price – Cost price

$\Rightarrow 10SP = 30SP - 30CP$

$\Rightarrow 30CP = 20SP$

$$\Rightarrow \frac{CP}{SP} = \frac{2 \xrightarrow{\times 240} 480}{3 \xrightarrow{\times 240} 720}$$

$\therefore$ Selling price of 1 meter of cloth

= Rs.720

60. (b) ATQ,

$$\text{Loss} = SP \times \frac{1}{8} \Rightarrow \frac{\text{Loss}}{SP} = \frac{1}{8}$$

$CP = 8 + 1 = 9$

$$\text{Loss\%} = \frac{1}{9} \times 100\% = 11\frac{1}{9}\%$$

61 (d) $\downarrow 20\% = \frac{-1 \rightarrow L}{5 \rightarrow SP}$

CP = 5 + 1 = 6 unit

SP (5 unit) → 800

CP (6 unit) → 960

SP at 25% Profit = 960 × 125% = 1200

62. (b) $\text{Gain} = 12.5\% = \frac{1 \rightarrow \text{Profit}}{8 \rightarrow SP}$

Cost price = 7

$$SP = \frac{24500}{7} \times 8 = 3500 \times 8 = ₹28000$$

$\therefore$ Selling rice of phone = ₹28000

63. (d) Loss on SP, $15\% = \frac{-3}{20}$

CP = 20 + 3 = 23 unit

20 unit = 640

$$23 \text{ unit} = \frac{640}{20} \times 23 = 736$$

$$15\% \text{ profit on CP} = \frac{23}{20} \times 736$$

= ₹846.40

64. (b) $\text{Profit} = \frac{1}{6} \text{ of SP} \Rightarrow \frac{P}{SP} = \frac{1}{6}$

CP = 6 – 1 = 5

$$\text{Profit \%} = \frac{1}{5} \times 100 = 20\%$$

65. (b) $\text{Gain} = \frac{1}{5} \text{ of SP}$

$$= \frac{1 \rightarrow \text{Profit}}{5 \rightarrow S.P}$$

$\Rightarrow C.P = 5 - 1 = 4$

$$\therefore \text{Gain\%} = \frac{1}{4} \times 100 = 25\%$$

66. (c) Given, $= \frac{1}{6}$ of SP

$$\Rightarrow \frac{1 \rightarrow \text{Profit}}{6 \rightarrow SP}$$

$\Rightarrow CP = 6 - 1 = 5$

$$\therefore \text{Gain \%} = \frac{1}{5} \times 100 = 20\%$$

67. (c) $\text{Gain} = \frac{1}{5}$ of SP

$$= \frac{1 \rightarrow \text{Profit}}{5 \rightarrow S.P}$$

$\Rightarrow C.P = 5 - 1 = 4$

$$\therefore \text{Gain\%} = \frac{1}{4} \times 100 = 25\%$$

68. (a) Given that article is sold of a loss of 40%

$$40\% = \frac{-2}{5} \Rightarrow \frac{3}{5} = \frac{SP}{CP}$$

Loss = (5 – 3) = 2

$\therefore$ Required percentage

$$= \frac{2}{3} \times 100 = 66.67\%$$

69. (a) Let, Loss = $4x$ & Profit = $5x$

ATQ,

$1498 - 5x = 1300 + 4x$

$\Rightarrow 9x = 1498 - 1300 = 198$

$\Rightarrow x = 22$

$\therefore CP = 1300 + 4 \times 22 = 1388$

$$SP \text{ at } 25\% \text{ profit} = 1388 \times \frac{5}{4}$$

= ₹1735

Alternate Method:-

$$\overbrace{1498 \underset{+5 \text{ unit}}{\text{———}} CP \underset{-4 \text{ unit}}{\text{———}} 1300}^{198}$$

Diff. 9 unit → 198

1 unit → 22

4 unit → 88

CP = 1300 + 88

= 1388

$$SP = 1388 \times \frac{125}{100}$$

= 1735

70. (a) Let x be the profit on ₹3000

ATQ,

$$3200 - \frac{7x}{5} = 3000 - x$$

$$\Rightarrow \frac{2x}{5} = 200 \Rightarrow x = 500$$

CP = 3000 – 500 = ₹2500

Alternate Method:

$$CP \underset{+5}{\text{———}} 3000 \underset{+7}{\text{———}} 3200$$

2 unit → 200

1 unit → 100

5 unit → 500

CP = 3000 – 500 = Rs.2500

71. (a) Let, the price ₹x

ATQ,

$$\frac{1920 - x}{x} \times 100 = \frac{x - 1280}{x} \times 100$$

$\Rightarrow 2x = 3200 \Rightarrow x = 1600$

$$SP \text{ at } 25\% \text{ profit} = 1600 \times \frac{5}{4}$$

= ₹2000

Alternate Method:

Reeta Ravi Vinay

1920 1280

CP of Ravi = $\frac{1920+1280}{2}$ = 1600

SP at 25% profit = $1600 \times \frac{5}{4}$ = 2000

72. (c)

1 : 2

53 —L— CP —P— 86

SP_1 SP_2

3 unit → 33

1 unit → 11

∴ Cost price = 53 + 1 × 11 = Rs.64

73. (c) Let, Profit/Loss = x , 20% = $\frac{+1}{5}$

ATQ,

Profit = Loss

⇒ $2100 - x = x + 1460$

⇒ $2x = 640$ ⇒ $x = 320$

CP of article = 1460 + 320 = 1780

Price of article to make 20% profit

SP of article = $1780 \times \frac{120}{100}$ = 2136

Alternate Method:

CP of article = $\frac{2100+1460}{2}$ = 1780

Price of article to make 20% profit

SP of article = $1780 \times \frac{120}{100}$ = 2136

Note:- Use digital sum method to avoid calculation

74. (c) ATQ,

1600——CP——1400

CP = $\frac{1600+1400}{2}$ = 1500

SP at 20% Profit

= $1500 \times \frac{6}{5}$ = 1800

75. (a) Given,

SP = 1170, Loss = 22%

1170 → 78%

1450 → $\frac{78}{1170} \times 1450$ = 96.66%

Loss % = 3.33%

Alternate Method:

22% = $\frac{-11}{50}$

CP SP

50 39

×30 ×30

1500 1170

Now,

Loss % = $\frac{1500-1450}{1500} \times 100$ = 3.33%

76. (d) ATQ,

390

680 ——— CP ——— 107

−1 2

3 unit = 390

1 unit = 130

CP = SP + L = 680 + 130 = ₹810

Alternate Method:

1P = 2L

CP = $\frac{1 \times 1070 + 2 \times 680}{3}$

CP = $\frac{1070+1360}{3} = \frac{2430}{3}$ = ₹810

77. (d)

Oranges Price

During Purchasing 11 10

During Selling 10 11

100 : 121

21% gain

Gain % = 21%

Alternate Method:

Price : Article

100 CP → $10_{\times 10}$: $11_{\times 10}$

121 SP → $11_{\times 11}$: $10_{\times 11}$

Profit % = $\frac{21}{100} \times 100$ = 21%

78. (b)

CP : SP

$\frac{5}{4} \times 60 + \frac{3}{2} \times 60 : \frac{4}{3} \times 120$

75 + 90 : 160

165 : 160

33 : 32

Loss % = $\frac{1}{33} \times 100 = 3\frac{1}{33}\%$

Alternate Method:

Price : Article

CP_1 → 5 : 4

CP_2 → $3_{\times 2}$: $2_{\times 2}$

33 CP → $11_{\times 3}$: $8_{\times 3}$

32 SP → $4_{\times 8}$: $3_{\times 8}$

Loss % = $\frac{1}{33} \times 100 = 3\frac{1}{33}\%$

SMART APPROACH:-

CP SP

$\left(\frac{5}{4}+\frac{3}{2}\right) : \left(\frac{4}{3}\times 2\right)$

$\frac{11}{4} : \frac{8}{3}$

33 : 32

Loss% = $\frac{1}{33} \times 100$

= $3\frac{1}{33}\%$

79. (c) No. of apples Price

$20_{\times 3}$ ⟶ $400_{\times 3}$

$12_{\times 5}$ ⟶ $264_{\times 5}$

Now,

CP → 60 units → 1200

SP → 60 units → 1320

∴ Profit percentage = $\frac{120}{1200} \times 100$

= 10%

80. (d) C.P of 20 dozen ⟶ 1200

1 dozen ⟶ 60

S.P of 5 dozen ⟶ 350 +10

1 dozen ⟶ 70

Profit % = $\frac{10}{60} \times 100 = 16\frac{2}{3}\%$

81. (a) Price : Article

300 CP → $50_{\times 6}$: $10_{\times 6}$

370 SP → $74_{\times 5}$: $12_{\times 5}$

Profit% = $\frac{70}{300} \times 100 = 23\frac{1}{3}\%$

Alternate Method:

Oranges Price

During Purchasing 10 50 = 600

During Selling 12 74 = 740

+140

Profit % = $\frac{140}{600} \times 100 = 23\frac{1}{3}\%$

82. (d) CP of 1 Pen = $\frac{15}{20} = \frac{3}{4}$

Pen Price

During Purchasing 20 15 = 225

During Selling 15 20 = 400

+175 unit

Profit (175 unit) = ₹245

225 unit = ₹315

CP = ₹315

∴ No. of sold pen

= $\frac{\text{CP(Total)}}{\text{CP(Per unit)}} = \frac{315 \times 4}{3}$ = 420

Alternate Method:

CP of 20 pens = 15

CP of 15 pens = $\frac{15 \times 15}{20}$ = 11.25

Profit per pen = $\frac{\text{SP of 15} - \text{CP of 15}}{15}$

= $\frac{20-11.25}{15} = \frac{8.75}{15}$

∴ Required number of pens

= $\frac{\text{Required profit}}{\text{Profit per pen}} = \frac{245}{\frac{8.75}{15}}$ = 420

SMART APPROACH:-

Quantity : Price

CP → (20 : 15) × 3

SP → (15 : 20) × 4

60 : 45

60 : 80

+35

Profit per pen = $\frac{35}{60}$

Required no. of pens

= $\frac{245 \times 60}{35}$ = 420

83. (a) Total CP = $\frac{60}{10} \times 72 + \frac{60}{12} \times 90 + 118$

= 432 + 450 + 118 = ₹ 1000

SP of 120 oranges = $1000 \times \frac{126}{100}$ = ₹1260

SP of 32 oranges = $\frac{1260}{120} \times 32$ = ₹336

84. (a)

A : P

CP_1 $12_{\times 5}$: $222_{\times 5}$

CP_2 $10_{\times 6}$: $225_{\times 6}$

CP 120 : 2460

SP at 20% profit = $2460 \times \frac{6}{5}$ = 2952

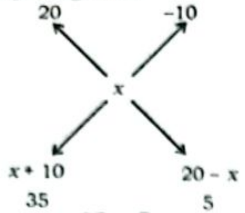
SP of 120 note book = 2952

SP of 15 note book = $\frac{2952}{120} \times 15$

= ₹369

85. (d) Let overall profit% = x

By Alligation:


20
−10
x
x + 10
20 − x
35
5

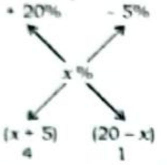
$\Rightarrow \frac{x+10}{20-x} = \frac{7}{1} \Rightarrow 8x = 130$

$\Rightarrow x = \frac{130}{8} = 16.25\%$

Alternate Method:

Profit% = $\frac{35 \times 20 - 5 \times 10}{40} = 16.25\%$

86. (c) Let overall profit% = x


+ 20%
− 5%
x%
(x + 5)
(20 − x)
4
1

Now, $\frac{20-x}{x+5} = \frac{1}{4} \Rightarrow x = 15\%$

Mukesh earns a profit of 15% i.e., 9,300.

CP for Mukesh = $\frac{9,300}{15} \times 100$

= ₹62,000.

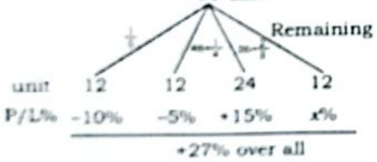
Alternate Method:

Profit% = $\frac{20 \times 4 - 1 \times 5}{5} = 15\%$

15% → 9300

100% → 62000

87. (b) Let the total number of apples = 60 unit


60 unit
Remaining
unit
12
12
24
12
P/L%
−10%
−5%
+15%
x%
+27% over all

$-120\% + (-60\%) + 360\% + 12x\%$

$= 60 \times 27\% \Rightarrow x = 120\%$

Given,

60 unit = 3600

12 unit = 720

SP at 120% = $720 \times \frac{220}{100}$ = ₹1584

88. (d) $\frac{5}{8} \times 20\% + \frac{3}{8} \times 0\% = 1 \times x$

$\Rightarrow x = 12\frac{1}{2}\%$

Alternate Method:

Let total number of articles = 8

$20\% = \frac{1}{5}$

Then, $SP_1 \rightarrow 6 \times 5 = 30$

$SP_2 \rightarrow 5 \times 3 = 15$

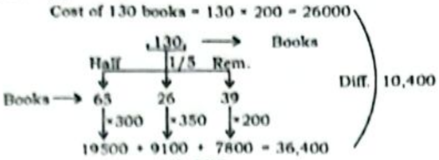
Total SP → 45

Total CP → 8 × 5 = 40

$\therefore$ Profit% = $\frac{45-40}{40} \times 100$

$= \frac{5}{40} \times 100 = 12\frac{1}{2}\%$

89. (b)


Cost of 130 books = 130 × 200 = 26000
130
Books
Half
1/5
Rem.
Books
65
26
39
×300
×350
×200
19500 + 9100 + 7800 = 36,400
Diff.
10,400

Profit% = $\frac{10,400}{26,000} \times 100 = 40\%$

Alternate Method:-

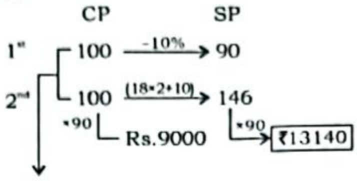
% of books → 50% : 20% : 30%

Profit → 50% 75% 0%

Profit% = $\frac{50 \times 5 + 75 \times 2 + 0 \times 3}{10}$

$= \frac{250 + 150}{10} = \frac{400}{10} = 40\%$

90. (c)


CP
SP
1st
2nd
100
90
−10%
100
146
(18×2+10)
×90
Rs.9000
×90
₹13140

Overall profit

$= \frac{200 \times 18}{100} = 36$ (Profit)

Alternate Method:

	I	II
P/L% →	−10	x
unit →	1	1
	Overall 18%	

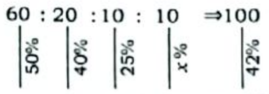
$2 \times 18\% = -10\% \times 1 + x\% \times 1$

$x = 46\%$

SP at 36% profit = 9000 ×146%

= 13140

91. (d)


60 : 20 : 10 : 10 ⇒100
50%
40%
25%
x%
42%

Profit → 30 8 2.5 $10x\%$ ⇒ 42

$\Rightarrow 10x\% = 42 - 40.5$

$\Rightarrow 10x\% = 1.5 \Rightarrow x\% = 0.15$

92. (a)

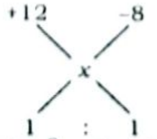
Item →	I	II	Total
Let, C.P. →	100	100	= 200
P/L% →	+12%	−8%	+4
S.P. →	112	92	= 204

$\therefore$ Profit % = $\frac{4}{200} \times 100 = 2\%$

Alternate Method:

Let the overall profit or loss = $x\%$

Then,



$\Rightarrow 12 - x = x + 8 \Rightarrow x = 2\%$

93. (a) Total CP = $1600 \times \frac{120}{12}$ = ₹16000

$\Rightarrow$ Total SP = 900 × 15 + 14 × 700

= ₹23300

$\Rightarrow$ Gain = 23300 − 16000 = 7300

$\therefore$ Gain% = $\frac{7300}{16000} \times 100\%$

= 45.625%

Alternate Method:

CP of mango = ₹$\frac{120}{12}$ = ₹10

Net Profit = 900 × (15 − 10) + 700 (14 − 10)

= 4500 + 2800 = 7300

Profit % = $\frac{7300}{16000} \times 100\% = 45.625\%$

94. (a) CP of 80 pens = 80 × 80 = 6400

SP after 20% Profit on 80 Pens

$= 6400 \times \frac{6}{5} = 7680$

40 pens price = $40 \times 80 \times \frac{80}{100} = 2560$

Remaining 40 pens price

= 7680 − 2560

selling price = 5120

Pen price = $\frac{5120}{40}$ = ₹128/pen

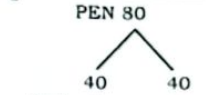
pens cost price = ₹80

pen selling price = ₹128

Profit% = $\frac{128-80}{80} \times 100$

$= \frac{48}{80} \times 100 = 60\%$

SMART APPROACH:-



unit 1 : 1

P/L% −20% +x

Overall 20%

$-20\% \times 1 + x\% \times 1$

$= 2 \times 20$

$x = 60\%$

95. (d) unit → 1 : 1

P/L% → + 10% −20%

% Change = $\frac{1 \times 10\% + 1 \times -20\%}{2}$

$= \frac{-10}{2} = -5\%$

(Negative sign shows loss %)

96. (b) CP_1 = 12000, CP_2 = 20000

Total CP = 32000

CP → 12000 : 20000

8 unit → 3 : 5

P/L % → +10% −20%

Loss%

$= \frac{3 \times 10\% + 5 \times -20\%}{8} = \frac{-70}{8}\%$

Loss = $32000 \times \frac{70}{8}\% = 2800$

SMART APPROACH:-

	I	II	Total
CP	12000	20000	= 32000
	×10%	−20%	loss 2800
SP	13200	16000	= 29200
			Loss = 2800

97. (c) 1st Bicycle 2nd Bicycle

unit 1 1

P/L% $\underbrace{10\% \qquad x\%}_{\text{overall } 20\%}$

$\Rightarrow \frac{10\% + x}{2} = 20\%$

$\Rightarrow 10\% + x = 40\%$

$\therefore x = 30\%$

98. (a) Given,

CP of both item is same.

$$\begin{array}{l} \quad\ \underline{CP} \quad \underline{SP} \\ I \to (4 : 5)\times 5 \to 20 : 25 \\ II \to (5 : 4)\times 4 \to \underline{20 : 16} \\ \qquad\qquad\qquad\quad 40 : 41 \end{array}$$

$\therefore$ Profit% $= \frac{1}{40} \times 100 = 2.5\%$

99. (c) $40 \times [(110 \times 200) + (120 \times 95) + (180 \times x)] = 112 \times 500 \times 40$

$22000 + 11400 + 180x = 56000$

$\Rightarrow x = 125.5$

$\Rightarrow$ Profit of 25.5%

$\therefore SP = \frac{125.5}{100} \times 40 = 50.22$ (Approx)

Alternate Method:

Using deviation,

Sugar quantity $\to$ 200kg : 120kg : 180kg

Unit $\Rightarrow$ 10 : 6 : 9

P/L% $\to \underbrace{10\% \quad -5\% \quad x\%}$

Overall = 12%

Let $x_1 = 12\%$

$\Rightarrow x\% = 12\% + \frac{20+102}{9}$

$= 12 + \frac{122}{9} = 25.5\%$ profit

SP per kg $= 40 \times \frac{125.55}{100}$

$= 50.22$ (Approx)

100. (b) Let, the total banana be 50 unit

50 (unit)

$\frac{1}{5}$ $\frac{2}{5}$ Remaining

(Rotten) 10 16 24

P/L% $\underline{-100\% \quad +15\% \quad +10\%}$

Total $-1000\% \ +240\% \ +240\% = \frac{-520\%}{50}$

Loss % = 10.4%

101. (b) Required % $= +20 - 20 - \frac{20 \times 20}{100}$

$= -4\% = 4\%$ loss

Alternate Method:

Loss% $= \frac{d^2}{100} = \frac{(-20\%)^2}{100} = -4\%$

102. (d)

$$\begin{array}{ccc} CP & : & SP \\ 5_{\times4} & : & 6_{\times4} \\ 5_{\times6} & : & 4_{\times6} \\ \hline 50 & : & 48 \end{array}$$

diff. 2 $\xrightarrow{\times 20}$ $\boxed{40}$; 48 $\xrightarrow{\times 20}$ 480

103. (c) L% = P% = 20%

$L\% = \frac{20^2}{100} = \frac{400}{100} = 4\%$

Loss% = 4%

Note:- If profit % = Loss% = a%

Then actual loss % $= \frac{a^2}{100}$

104. (d) $20\% = \frac{-1}{5}$, $15\% = \frac{+3}{20}$

$$\begin{array}{l} CP : SP \qquad\quad CP : SP \\ (5 : 4)\times 23 \to 115 : 92 \\ (20 : 23)\times 4 \to 80 : 92 \end{array}$$

(115 + 80)unit = ₹19500

CP of items sold at profit (80unit)

$= \frac{19500}{195} \times 80 =$ ₹8000

105. (c) Let C.P of Buffaloes$_1$ = B_1

Buffaloes$_2$ = B_2

ATQ,

$\Rightarrow B_1 \times \frac{85}{100} = B_2 \times \frac{119}{100}$

$\Rightarrow \frac{B_1}{B_2} = \frac{7}{5}\Big)$ 12 unit (C.P.)

$\Rightarrow$ C.P (12 unit) = 11520

C.P. of B_1 (7 unit) $= \frac{11520}{12} \times 7$

= ₹6720

Alternate Method:

$$\begin{array}{l} \quad\ CP : SP \qquad CP : SP \\ I \to 20_{\times7} : 17_{\times7} \to 140 : 119 \\ II \to 100 : 119 \to 100 : 119 \end{array}$$

240 unit = 11520

140 unit = 6720

106. (b) $40\% = \frac{2}{5}$, $25\% = \frac{1}{4}$, $12\% = \frac{3}{25}$

$$\begin{array}{ccc} CP & : & SP \\ 4 & & 5 \\ 5 & & 7 \\ 25 & & 28 \end{array}$$

But SP is same

Let SP = (LCM of 5, 7 and 28) = 140

$$\begin{array}{ccc} CP & : & MP \\ 112 & & 140 \\ 100 & & 140 \\ \underline{125} & & \underline{140} \\ 337 & & 420 \end{array}$$

83

Profit % $= \frac{83}{337} \times 100 \approx 24.63$

107. (c) $25\% = \frac{1}{4}\Big)+$

$$\begin{array}{ccc} CP & : & SP \\ 4 & \xrightarrow{+1} & 5 \\ 6 & \xrightarrow{-1} & 5 \end{array}$$

$\therefore$ Loss% $= \frac{1}{6} \times 100 = 16\frac{2}{3}\%$

Alternate Method:

By direct formula:

Overall P/L% $= \frac{100(x+y)+2xy}{200+x+y}$

$\Rightarrow 0 = \frac{100(25+y)+2\times25\times y}{200+25+y}$

$\Rightarrow 2500 + 100y + 50y = 0$

$\Rightarrow y = \frac{-2500}{150} = \frac{-50}{3}\% = 16\frac{2}{3}\%$ loss.

108. (b) $25\% = \frac{1}{4}$, $20\% = \frac{1}{5}$

$$\begin{array}{l} CP : SP \qquad CP : SP \\ 4_{\times2} : 3_{\times2} \Rightarrow 8 : 6 \\ 5 : 6 \qquad\quad\ \ \underline{5 : 6} \\ \qquad\qquad\quad\ \ 13 \quad 12 \end{array}$$

Loss = 13 − 12 = 1

$\therefore$ Loss % $= \frac{1}{13} \times 100\% = 7.7\%$

Alternate Method:-

Overall profit/loss%

$= \frac{100(x+y)+2xy}{200+x+y}$

$= \frac{100(-25+20)+2\times(-25)\times20}{200+(-25)+20}$

$= \frac{-500-1000}{195} = -7.7\%$

(Negative sign shows loss %)

109. (b) When SP same

$A \times 110 = B \times 75$

$\Rightarrow \frac{A}{B} = \frac{75}{110} = \frac{15}{22}$

CP = 15 : 22

110. (b) $A \times 80 = B \times 110$

$\Rightarrow \frac{A}{B} = \frac{110}{80}$

Given,

Cost price of two T.V (190 unit) = 2280

SP of TV sold at loss (110 unit)

$= \frac{2280}{190} \times 110 =$ ₹1320

111. (a) C.P of I cow $= \frac{15640}{115} \times 100 = 13600$

C.P of II cow $= \frac{15640}{85} \times 100 = 18400$

$\Rightarrow$ Total CP = 32000

Total SP = 31280

$\therefore$ Loss = ₹720

Alternate method:

Overall loss % $= 15 - 15 - \frac{15\times15}{100}$

= 2.25%

$2.25\% = \frac{9}{400}$

$$\begin{array}{l} CP : SP \\ 400 : 391 \xrightarrow{\times 40} 15640 \end{array}$$

Total loss = 40 × 9 × 2 = ₹720

112. (c) SP of A = SP of B

$= \frac{48640}{2} = 24320$

ATQ,

$CP_A = \frac{24320}{128} \times 100 = 19000$

$CP_B = \frac{24320}{76} \times 100 = 32000$

113. (b) C.P of $W_1 = \frac{12600}{126} \times 100 = 10000$

C.P of $W_2 = \frac{12600}{90} \times 100 = 14000$

Total CP = 24000

Total SP = 25200

Profit % $= \frac{1200}{24000} \times 100 = 5\%$

Alternate Method:

Overall Gain/Loss%

$= \left(\frac{100(x+y)+2xy}{200+x+y}\right)\%$

$= \left(\frac{100(16)-520}{216}\right)\%$

$= \left(\frac{1080}{216}\right)\% = 5\%$ Gain

114. (b) $18\% = \frac{9}{50}$, $22\% = \frac{11}{50}$

	CP	SP	
A	$50_{\times 39}$	$59_{\times 39}$	(Profit)
B	$50_{\times 59}$	$39_{\times 59}$	(Loss)

Make SP equal-
CP of A = 1950
CP of B = 2950
Total CP = 4900
4900 unit = 800
CP(A) → 1950 unit = ₹318.37
CP(B) → 2950 unit = ₹481.63

Alternate Method:

Overall profit/loss%

$= \frac{10(x+y)+2xy}{200+x+y}$

$= \frac{100(18-22)+2\times 18\times(-22)}{200+18-22}$

$= \frac{-400-792}{196} = \frac{-1192}{196} = -6.08\%$

Now,

18   −22
−6.08
15.92   24.08

ATQ,
40 unit → 800
1 unit → 20
A = 15.92 × 20 = 318.4 ≈ 318.37
B = 24.08 × 20 = 481.6 ≈ 481.63

SMART APPROACH:-

A × 118 = B × 78

$\frac{A}{B} = \frac{78}{118} = \frac{39}{58}$ ×13(A)

Only Option (b) is multiple of 13

115 (a) Let CP = 100

Total loss % $= \frac{R^2}{100} = \frac{18^2}{100} = 3.24$

SP = 100 − 3.24 = 96.76
96.76 unit = 30 × 2 = ₹60
Loss (3.24) unit = ₹2

Alternate Method:

Total loss% $= \frac{R^2}{100} = \frac{18^2}{100} = 3.24\%$

Now,

Loss $= \frac{3.24\times 30\times 2}{100} = 1.944 - 2$

116. (b) Let $SP_1 = 100$ then, $CP_2 = 100$

$CP_1 = \frac{100\times 100}{120} = \frac{1000}{12}$

$SP_2 = 100\times\frac{90}{100} = 90$

Profit% $= \frac{190-\left(\frac{1000}{12}+100\right)}{\left(\frac{1000}{12}+100\right)}$

$= \frac{\frac{80}{12}}{\frac{2200}{12}}\times 100 = 3\frac{7}{11}\%$

Alternate Method:

Given,
$CP_2 = SP_1$

	CP	SP		
I^{st} item	(5	$6)_{\times 5}$ →	25	30
IInd item	(10	$9)_{\times 3}$ →	30	27
			55	57

+2

Profit % $= \frac{2}{55}\times 100 = 3\frac{7}{11}\%$

117. (a) Req. profit%

$= \frac{40}{960}\times 100 = \frac{1}{24}\times 100 = 4\frac{1}{6}\%$

Alternate Method:

	CP	SP
Rate →	1	1
Quantity →	960	1000
Price →	96	100

∴ Profit% $= \frac{100-96}{96}\times 100$

$= \frac{100}{24} = 4\frac{1}{6}\%$

118. (b) $22\% = \frac{22}{100}$, $35\% = \frac{35}{100}$

	CP	SP
Price/Rate →	100	78
Quantity →	65	100
	65	78

+13 profit

Actual profit $= \frac{13}{65}\times 100 = 20\%$

Alternate Method:

Let 100 gm = ₹100

CP	SP
100	78
65	

+13

Profit % $= \frac{13}{65}\times 100 = 20\%$

119. (a)

CP		SP
100	:	150
100	:	80
900	:	1000
3	:	4

P% $= \frac{1}{3}\times 100 = 33.33\% \sim 33\%$

Alternate Method:

Let 1000 gm = ₹1000

CP	SP	MP
1000	1200	1500
900		

−300   −20%

Profit% $= \frac{300}{900}\times 100 = 33\frac{1}{3}\% \sim 33\%$

120. (b)

CP		SP
870	:	1000

diff.
130

Profit % $= \frac{130}{870}\times 100 = 14.94\%$

121. (b)

C.P		S.P
800	:	1000

Diff. = 200

Profit % $= \frac{200}{800}\times 100 = 25\%$

122. (d) Cheating in weight = 12% $= \frac{3}{25}$

profit % = 10% $= \frac{+1}{10}$

	CP		SP
Weight →	22	:	25
Profit →	10	:	11
	4	:	5

diff.
1

∴ Total Profit % $= \frac{1}{4}\times 100 = 25\%$

123. (b)

	CP		SP
Price →	30	:	36
Quantity →	800	:	1000
	2	:	3

∴ Profit% $= \frac{3-2}{2}\times 100 = 50\%$

124. (b)

CP		SP
5	:	6
950	:	1000
95	:	120

diff.
25

Profit% $= \frac{25}{95}\times 100 = \frac{500}{19}\%$

125. (c) Profit = SP − CP

$= (95-76) + \frac{76}{20} = 19 + 3.8 = 22.8$

126. (c)

Price →	10	:	7.2
Quantity →	900	:	1000
	9	:	7.2

% Change $= \frac{9-7.2}{9}\times 100 = 20\%$

127. (b)

	CP		SP
	40	:	44
Price →	10	:	11
Quantity →	800	:	1000
	8	:	11

Gain% $= \frac{11-8}{8}\times 100$

$= \frac{3}{8}\times 100 = 37.5\%$

128. (c) ∵ 100 gm less in 3000 gm
= 2900 gm
CP for 1 kg = Rs. 12
CP for 2900 gm = 12 × 2.9
= Rs. 34.8
Profit = SP − CP
= 46 − 34.8 = Rs. 11.2

129. (c) 25% = $\frac{1}{4}$, 12.5% = $\frac{1}{8}$

$$\begin{array}{ccc} CP & : & SP \\ 3 & : & 4 \\ 4 & : & 5 \\ 8 & : & 9 \\ \hline 24 & : & 45 \end{array}$$

∴ Profit% = $\frac{45-24}{24} \times 100$

$= \frac{2100}{24} = 87.5\%$

130. (a)
$$\begin{array}{ccc} CP & : & SP \\ 81 & : & 100 \\ 20 & : & 27 \\ \hline 3 & : & 5 \end{array}$$

Profit% = $\frac{2}{3} \times 100 = 66.67\%$

131. (d)
$$\begin{array}{ccc} CP & : & SP \\ 4 & : & 3 \\ 11 & : & 20 \\ \hline 11 & : & 15 \end{array}$$
$\underbrace{11 \quad : \quad 15}_{\text{diff } 4}$

∴ Profit% = $\frac{4}{11} \times 100 = 36\frac{4}{11}\%$

132. (c) ↓40% = $\frac{-2}{5}$, ↓25% = $\frac{-1}{4}$

$$\begin{array}{ccc} CP & : & SP \\ 5 & : & 3 \\ 3 & : & 4 \\ \hline 5 & : & 4 \end{array}$$

∴ Loss% = $\frac{1}{5} \times 100 = 20\%$

133. (a)
$$\begin{array}{cccc} & CP & : & SP \\ \text{Weight} \rightarrow & 850 & : & 1000 \end{array}$$
Profit → 150

∴ Gain % = $\frac{150}{850} \times 100 = 17.65\%$

134. (d) 20% = $\frac{1}{5}$; 25% = $\frac{1}{4}$

$$\begin{array}{cc} C.P & S.P \\ 5 & 4 \\ 3 & 4 \\ \hline 15 & 16 \end{array}$$
$\underbrace{15 \quad 16}_{1}$

Profit % = $\frac{1}{15} = 6.67\%$

135. (c)
$$\begin{array}{ccc} CP & : & SP \\ 950 & : & 1000 \end{array}$$
$\underbrace{950 \quad : \quad 1000}_{+50}$

P% = $\frac{50}{950} \times 100 = \frac{100}{19} = 5\frac{5}{19}\%$

136. (a)
$$\begin{array}{ccc} C.P & & S.P \\ 25 & : & 33 \\ 4 & : & 5 \\ \hline 20 & & 33 \end{array}$$
$\underbrace{20 \quad 33}_{13}$

32% = $\frac{8}{25}$

20% = $\frac{1}{5}$

Profit% = $\frac{13}{20} \times 100 = 65\%$

137. (a)
$$\begin{array}{ccc} C.P & : & S.P \\ 100 & : & 90 \\ 40 & : & 50 \\ \hline 8 & & 9 \end{array}$$
$\underbrace{8 \quad 9}_{1}$

Profit% = $\frac{1}{8} \times 100 = 12.5\%$

138. (a) 24% = $\frac{6}{25}$

$$\begin{array}{ccc} CP & : & MP \\ 25 & & 19 \\ 100 & & 200 \\ \hline 100 & : & 152 \end{array}$$
$\underbrace{100 \quad : \quad 152}_{52\% \text{ profit}}$

139. (d)
$$\begin{array}{cc} CP & SP \\ 100 & 18 \\ 72 & 100 \\ \hline \end{array}$$
⇒ 72 : 18

⇒ 4 : 1

∴ Loss % = $\frac{3}{4} \times 100 = 75\%$

140. (d)
$$\begin{array}{ccc} CP & : & SP \\ 64 & : & 80 \\ 800 & : & 1000 \\ \hline 16 & : & 25 \end{array}$$
$\underbrace{16 \quad : \quad 25}_{\text{Diff. } 9}$

Profit % = $\frac{9}{16} \times 100 = 56.25\%$

141. (a)
$$\begin{array}{cc} SP & CP \\ 1000 & 925 \end{array}$$
Difference → 75

Profit % = $\frac{75}{925} \times 100 = 8.11\%$

142. (d)
$$\begin{array}{ccc} x & : & y \\ 800 & : & 1000 \\ \hline 4x & : & 5y \end{array}$$
(4x : 5y) = (5 : 4),

∴ $\left(40\% = \frac{2}{5}\right)$

$\frac{4x}{5y} = \frac{5}{7} \Rightarrow \frac{x}{y} = \frac{25}{28}$) +3

T = $\frac{3}{25} \times 100 = 12\%$

143. (d) Weight of rice sold in black market = $\frac{450}{1000} \times 100 = 45$ kg.

Price of rice sold in black market

$= \frac{2520}{45} =$ ₹56 Per./kg

Now,

$$\begin{array}{lccc} & \text{Black Market Price} & : & \text{Original Price} \\ & 56 & : & 40 \\ \text{Price Ratio} \rightarrow & 7 & : & 5 \end{array}$$

Required ratio will be 7 : 5 of rice

144. (b) 20% = $\frac{1}{5}$, 15% = $\frac{3}{20}$

$$\begin{array}{ccc} CP & : & SP \\ 5 & : & 6 \\ 900 & : & 1000 \\ 20 & : & 17 \\ \hline 15 & : & 17 \end{array}$$
$\underbrace{15 \quad : \quad 17}_{+2}$

Profit % = $\frac{2}{15} \times 100 = 13.33\%$

145. (c) P = 28%

∴ (100 + 28) → 3.2 kg(1kg = 1000 gm)

128% → 3200 gm

∴ 100% → $\frac{3200}{128} \times 100$

= 2500 gm

Alternate Method:

$$\begin{array}{lcc} & CP & SP \\ \text{Rate} \rightarrow & 1 & 1 \\ \text{Price} \rightarrow & 100 & 128 \\ \hline \text{Quantity} \rightarrow & 100 & 128 \end{array}$$

ATQ,

128 → 3200 g

100 → $\frac{3200 \times 100}{128} = 2500$ g

146. (d)
$$\begin{array}{ccc} CP & SP & \text{New SP} \\ 100 & 125 & 110 \end{array}$$
+25%

+10%

∴ Discount% = $\frac{15}{125} \times 100 = 12\%$

147. (b)
$$\begin{array}{lccc} & CP & & SP \\ \text{Purchase} \rightarrow & 1000 & : & 950 \\ \text{Sell} \rightarrow & 750 & : & 1000 \\ \hline & 15 & : & 19 \end{array}$$
$\underbrace{15 \quad : \quad 19}_{+4}$

Profit % = $\frac{4}{15} \times 100 = 26.67\%$

148. (a) 12% = $\frac{12}{100} \xrightarrow{-} = \frac{88}{100}$, 25% = $\frac{1}{4} \xrightarrow{+} = \frac{5}{4}$

$$\begin{array}{ccc} CP & & SP \\ 88 & \times & 100 \\ 4 & & 5 \\ \hline 400 & & 440 \\ 10 & : & 11 \end{array}$$

∴ Required% = $\frac{1}{10} \times 100 = 10\%$

149. (c)
$$\begin{array}{lcc} & CP & SP \\ \text{Price} \rightarrow & 36 & 40 \\ \text{Quantity} \rightarrow & 800 & 1000 \\ \hline \text{Final Price} \rightarrow & 72 & 100 \end{array}$$
$\underbrace{72 \quad 100}_{+28}$

∴ Profit% = $\frac{28}{72} \times 100 = 38.89\%$

150. (b)
$$\begin{array}{lccc} & CP & & SP \\ \text{Rate} \rightarrow & 1 & & 1 \\ \text{Quantity} \rightarrow & 920 & & 1000 \\ \hline \text{Price} \rightarrow & 92 & & 100 \\ & 23 & : & 25 \end{array}$$

∴ Gain% = $\frac{25-23}{23} \times 100$

$= \frac{200}{23} = 8.70\%$

151. (d) Let original tape be 100 cm.

$$\begin{array}{cc} \text{CP} & \text{SP} \\ 100 & 105 \\ 95 & 100 \\ \hline 95 & 105 \end{array}$$

$$\text{Gain\%} = \frac{10}{95} \times 100 = 10\frac{10}{19}\%$$

152. (a) ATQ,

$$\begin{array}{ccc} \text{CP} & & \text{SP} \\ 100 & & 108 \\ 75 & & 100 \\ \hline 25 & : & 36 \end{array}$$

$$\underbrace{25 : 36}_{+11}$$

$$\text{Profit \%} = \frac{11}{25} \times 100 = 44\%$$

153. (c)

$$\begin{array}{ccc} \text{CP} & : & \text{SP} \\ 93 & : & 100 \end{array}$$

$$\underbrace{93 : 100}_{+7}$$

$$\therefore \text{Profit\%} = \frac{7}{93} \times 100 = 7\frac{49}{93}\%$$

154. (c) $4\% = \frac{1}{25}\overset{+}{\curvearrowleft} = \frac{26}{25}$

ATQ,

$$\begin{array}{rccc} & \text{CP} & & \text{SP} \\ \text{Quantity} \rightarrow & 940 & : & 1000 \\ \text{Price} \rightarrow & 25 & : & 26 \\ \hline & 47 & : & 52 \end{array}$$

$$\underbrace{47 : 52}_{+5}$$

$$\therefore \text{Profit \%} = \frac{5}{47} \times 100 = 10.64\%$$

155. (c) The cost price of 1000 gm rice is x

The cost price of 950 gm rice

$$= \frac{x}{1000} \times 950 = \frac{95x}{100}$$

To earn a profit of 15% after the faulty weight the SP should be

$$= \frac{95x}{100} \times \frac{115}{100} = 1.0925x$$

156. (d) 400 gm → 50 gm (Profit)

200 gm → 25 gm (Profit)

Actually → 200 – 25 = 175 gm

Given,

1000 gm → ₹880

1 gm = ₹0.88

Actual SP for 25% profit

$$= 175 \times 0.88 \times \frac{5}{4} = ₹192.5$$

157. (a) Loss = 15%↓

$$\begin{array}{rcc} & \text{CP} & \text{SP} \\ \text{Rate} \rightarrow & 100 & 85 \\ \text{Quantity} \rightarrow & 20 & 25 \\ \hline & 80 & 85 \end{array}$$

$$\underbrace{80 \quad 85}_{+5}$$

$$\text{Profit \%} = \frac{5}{80} \times 100 = 6.25\%$$

158. (d)

$$\left.\begin{array}{l} 1 \text{ kg} \rightarrow 54 \text{ SP} \\ 1 \text{ kg} \rightarrow 36 \text{ CP} \end{array}\right\} \text{Rs. 18 profit}$$

1000 gm – 950 gm = 50 gm

1000 gm → 36

$$\Rightarrow 50 \text{ gm} = \frac{36}{1000} \times 50 = 1.8$$

$$\therefore \text{Profit} = 18 + 1.8 = 19.8$$

SMART APPROACH:-

CP = 36 SP = 54

1000g —— 36

$$950\text{g} —— \frac{36}{1000} \times 950$$

$$= 34.2$$

P = SP – CP

= 54 – 34.2 = 19.8

159. (b) 12% cheating on buying

12% cheating on selling

$$\text{Overall profit\%} = 12 + 12 + \frac{12 \times 12}{100}$$

$$= 24 + 1.44 = 25.44\%$$

160. (a) Before Raid,

Due to Fault in Machine it reads 1 kg when 900 gm is actually weighted and the shopkeeper also marks 10% above

900 → 1000 → 1100

$$\Rightarrow \text{Profit} = \frac{2}{9}$$

After Raid,

Gave punishment to sell the goods at 10% discount on cost price for a month

Cost price = 10

Selling price = 9

Before the Raid Price

$$= \frac{20}{9} \times 10 \times \frac{11}{9} = \frac{2200}{81} = ₹27.16$$

SMART APPROACH:-

$$\begin{tikzcd} \text{CP of Customer } 1000 \arrow[r, bend left, dash, "+10\%"] & \overset{\text{MP}}{1100} \\ \text{Actual CP } 900 \arrow[u, bend left, dash, "-10\%"] \arrow[r, dash, "-10\%"] & 810 \end{tikzcd}$$

810 unit —— 20

$$1100 \text{ unit} —— \frac{20}{810} \times 1100$$

$$= ₹27.16$$

161. (d)

$$\begin{array}{ccc} \text{CP} & : & \text{SP} \\ 750 & : & 1000 \\ 100 & : & 115 \\ 100 & : & 90 \\ \hline 50 & : & 69 \end{array}$$

$$\underbrace{50 : 69}_{19}$$

$$\text{Profit \%} = \frac{19}{50} \times 100 = 38\%$$

162. (a)

$$\begin{tikzcd} \overset{\text{CP}_1}{100} \arrow[r, bend left, dash, "+10\%"] \arrow[d, "-20\%"'] & \overset{\text{SP}_1}{110} \arrow[d, "+2\text{unit}"] \\ (\text{CP}_2)\ 80 \arrow[r, bend right, dash, "+40\%"'] & 112\ (\text{SP}_2) \end{tikzcd}$$

2 unit → 1000 Rs.

∴ C.P of article (100 unit)

= 500 × 100 = 50,000 Rs.

163. (b)

$$\begin{array}{ccc} \text{CP} & : & \text{SP} \\ 100x & : & 125x \\ \downarrow +20\% & & \downarrow +10\% \\ 120x & : & 125x \times \frac{110}{100} \\ 48 & : & 55 \end{array}$$

$$\text{Profit \%} = \frac{7}{48} \times 100 = 14.6\%$$

164. (b) Let, CP = 100

Profit = 320% of 100 = 320

∴ Selling price = 100 + 320 = 420

$$\begin{array}{ccc} \text{CP} & : & \text{SP} \\ 100 & : & 420 \\ \Big\downarrow +10\% & & \Big\downarrow \begin{smallmatrix}\text{Remains} \\ \text{Constant}\end{smallmatrix} \\ 110 & : & 420 \end{array}$$

Profit = 420 – 110 = 310

$$\text{Required \%} = \frac{310}{420} \times 100 = 73.8\%$$

165. (d) Let, the CP of article be $10x$ and SP be $9x$

$$\Rightarrow (10x - 5) \times \frac{11}{10} = (9x + 8)$$

$$\Rightarrow 110x - 55 = 90x + 80$$

$$\Rightarrow x = \frac{135}{20}$$

Original selling price ($9x$)

$$= \frac{135}{20} \times 9 = \frac{243}{4} = 60.75$$

166. (c)

$$\begin{tikzcd} \underset{100}{\text{CP}} \arrow[rr, bend left, "20\%"] \arrow[dr, "\frac{1}{2}\text{th}"] & & \underset{120}{\text{SP}} \\ & \text{New CP } 50 \arrow[ur, "+70"'] & \end{tikzcd}$$

$$\text{Profit\%} = \frac{70}{50} \times 100 = 140\%$$

167. (a)

$$\begin{tikzcd} \underset{100}{\text{CP}} \arrow[rr, bend left, "+20\%"] \arrow[dr, "+140"'] & & \underset{120}{\text{SP}} \arrow[dl, "\times 2"] \\ & 240 & \end{tikzcd}$$

$$\text{Profit \%} = \frac{140}{100} \times 100\% = 140\%$$

168. (b)

	CP	SP	Profit
Initial →	100	155	55
New →	124	155	31

$$\therefore \text{New profit \%} = \frac{31}{124} \times 100 = 25\%$$

169. (d)

$$\begin{tikzcd} \overset{\text{CP}_1}{100} \arrow[r, "-25\%"] \arrow[d, "\times 2"] & \overset{\text{SP}_1}{75} \arrow[d, bend left, dash, "+165"] \\ \text{CP}_2\ 200 \arrow[r, "+20\%"'] & 240\ \text{SP}_2 \end{tikzcd}$$

165 unit = 660

1 unit = 4

∴ Original CP = 4 × 100 = ₹400

170. (b)

$$\begin{tikzcd} \overset{\text{CP}_1}{100} \arrow[r, "-18\%"] \arrow[d, "-30\%"] & \overset{\text{SP}_1}{82} \arrow[d, bend left, "+2"] \\ \text{CP}_2\ 70 \arrow[r, "+20\%"'] & 84\ \text{SP}_2 \end{tikzcd}$$

2 unit → 144

1 unit → 72

∴ Original SP = 82 × 72 = 5904

171. (a)

$$\frac{7}{10} \times \text{SP} = \frac{9}{10} \times \text{CP}$$

$$\Rightarrow \frac{\text{SP}}{\text{CP}} = \frac{9}{7}$$

$$\therefore \text{Profit\%} = \frac{2}{7} \times 100 = \frac{200}{7}\ \%$$

172. (c) $25\% = \frac{1}{4}$, $20\% = \frac{1}{5}$

A.T.Q,

	CP		SP
Before in crease →	4	:	5
	+①↓		↓+①
After increase →	5	:	6

(1) unit = ₹200

Original CP = 200 × 4 = ₹800

Alternate Method:

CP		SP
4	:	5
5	:	6
200		200

(5 × 5 – 6 × 4) → (6 × 200 – 5 × 200)

1 unit → 200

(CP)4 unit → 800

173. (a)

$$\begin{tikzcd} \text{CP}_1 & \text{SP}_1 \\ 100 \arrow[r] \arrow[d] & 84 \arrow[d, bend left, "+660"] \\ 100 \arrow[r] & 108 \\ \text{CP}_2 & \text{SP}_2 \end{tikzcd}$$

ATQ,

24 unit = 660 Rs.

100 unit = 2750 Rs.

$SP = 2750 \times \frac{112}{100} = 3080$ Rs.

SMART APPROACH:-

CP × 112%

16 7

Only option (a) is multiple of 7

174. (c) CP being same, CP ∝ quantity

10% 40%

20%

20 10

Amount → 2 : 1

ATQ,

3 unit → 1000 grm

1 unit → $\frac{1000}{3} = 333\frac{1}{3}$ kg.

Alternate Method:-

Let,

A + B = 1000

$\frac{10}{100} \times A + \frac{40}{100} \times B = \frac{20}{100} \times 1000$

$\Rightarrow \frac{A}{10} + \frac{4}{10}B = 200$

⇒ A + 4B = 2000

and A + B = 1000

$\Rightarrow B = \frac{1000}{3} = 333\frac{1}{3}$ kg.

175. (a)

Quantity → 1 : 3 = 4

↓ ↓ ↓

Profit/loss → –12% : x% = +25%

Overall profit/loss

⇒ –12 + 3x = 100

$\Rightarrow 3x = 112 \Rightarrow x = \frac{112}{3}\% = 37.33\%$

Alternate Method:

–12% x%

+25%

$\frac{37}{3}\%$ 37%

Amount → 1 : 3

$x\% = \left(25 + \frac{37}{3}\right)\%$

$= \left(\frac{75+37}{3}\right)\% = \frac{112}{3}\% = 37.33\%$

176. (b)

	Ist	IInd
Profit → ratio	12%	x %

$15\frac{27}{51}\%$

CP → ratio $\left(x - 15\frac{27}{51}\%\right)$ $3\frac{27}{51}\%$

As it is given, the CP of article is same, then CP ratio will also equal.

So, $x\% - 15\frac{27}{51}\% = 3\frac{27}{51}\%$

$\Rightarrow x = 18\frac{54}{51} = 19\frac{3}{51}\%$

Now,

$\Rightarrow 19\frac{3}{51} - 12\% = 7\frac{1}{17}\% \to 3600$

1% → 510

100% → 51000

177. (b)

	Laptop		Scanner
Price →	56000		22000
	28	:	11
Profit →	20%		15%

∴ Required %

$= \frac{28 \times 20\% + 15\% \times 11}{28 + 11} \times 100$

$= 18\frac{23}{39}\%$

Alternate method:

56000	22000
28	11
Laptop	Printer
20%	15%

x

x – 15 20 – x

$\Rightarrow \frac{x-15}{20-x} = \frac{28}{11}$

⇒ 11x – 165 = 560 – 28x

⇒ 39x = 725

$\Rightarrow x = \frac{725}{39} = 18\frac{23}{39}\%$

178. (a)

I	II
9%	19%

15%

4 6

Quantity → 2 : 3 = 5 unit

↓×130 ↓×130

$\boxed{260}$ 650

∴ Quantity of wheat = 260 kg.

179. (a) By alligation:

L	P
– 35%	x%

0%

Quantity → 2 : 3

ATQ,

$\frac{x}{35} = \frac{2}{3} \Rightarrow x = \frac{70}{3} = 23\frac{1}{3}\%$ (Profit)

SMART APPROACH:-

Let the total unit be 5

2 3

–35%

–70% $\frac{+70\%}{3} = 23\frac{1}{3}\%$

↑

For no profit or no loss

180. (c) By alligation:

I	II
10 %	–10%

x%

x + 10 10 – x

12 : 10

ATQ,

$\frac{x+10}{10-x} = \frac{12}{10} = \frac{6}{5}$

⇒ 5x + 50 = 60 – 6x ⇒ 11x = 10

$\Rightarrow x = \frac{10}{11} = 0.909\%$

Since, it is positive, hence profit.

SMART APPROACH:-

	I		II	
	12000	:	10000	
unit	6	:	5	= 11
P/L%	+10%		–10%	
	60%		–50%	$= \frac{10\%}{11}$

= 0.909% Profit

181. (c)

25% –10%

0%

Price → 10 : 25

2 : 5 = 7 unit

↓×500 ↓ ↓×500

1000 2500 3500

182. (d)

30%

10% –20%

2 3

5 unit

5 unit = 30%

$2 \text{ unit} = \frac{30}{5} \times 2 = 12\%$

Combined Loss% = –20% + 12% = – 8%

(Negative sign shows loss %)

Alternate method:

unit → 2 : 3

P/L % → +10% −20%

$$\text{Req. \%} = \frac{2\times10\% + 3\times -20\%}{5} = -8\%$$

(Negative sign shows loss %)

183. (a) By using Alligation method:

P% P%
20 12
18
6 2
Amount → 3 : 1
4 unit → 2220
∴ 1 unit → 555

184. (b) CP = ₹3900, P = ₹540

$$P\% = \frac{540}{3900}\times100 = \frac{540}{39}\%$$

By alligation:

Table Chair
+8% +16%
$\frac{540}{39}\%$
84 228
CP→ 7 : 19

⇒ (7 + 19) unit = 26 unit → 3900

$$\Rightarrow (19-7)\ \text{unit} = 12\text{unit} \rightarrow \frac{3900}{26}\times12$$

= ₹1800

SMART APPROACH:-

Table Chair 3900×8% = 312
8% 8% + 8%(16%) 540 (given)
−312
28.5 228
(Extra) 8% $\xrightarrow{28.5}$ 228
Chair 100% ⟶ 2850 diff.
Remaining table ⟶ 1050
diff. ⟶ 1800

185. (d) Overall P% $= \frac{160.80}{900}\times 100$

$$= \frac{536}{30}\%$$

By alligation:

Bag Bottle
20×30 12×30
$\frac{536}{30}$×30

Hence,

Bag Bottle
600 360
536
176 64
11 : 4

$$\therefore \text{CP of bottle} = \frac{4}{15}\times900 = ₹240$$

186. (c)

I II
+20% −5%
+15%
20 : 5
4 : 1

∴ Required ratio = 1 : 4

187 (a) Profit % on tables = 15%

Loss% on chairs = −10%

$$\text{Overall \% profit} = \frac{300}{12000}\times100$$

= 2.5%

By Alligation Method,

Table Chair
15% −10%
2.5%
CP → 12.5 : 12.5
1 : 1

2 unit = ₹12000

$$\text{So, cost of tables} = \frac{12000}{2} = ₹6000$$

188 (c) Over all profit %

$$= \frac{2080}{15400}\times100 = \frac{1040}{77}\%$$

T C
(770)10% $_{\times77}$ 20% $_{\times77}$(1540)
$\frac{1040}{77}\%\times77$
500 : 270

Price/quantity 50 : 27

77 unit → 15400
1 unit → 200
27 unit → 5400
9 chairs price → 5400
∴ 3 chairs price → ₹1800

SMART APPROACH:-

5 Table 9 Chair
P% 10% 10% + 10%
Overall = 15400 × 10% extra
= 1540
Remaining = 2080 − 1540 =540
10% —— ₹540
100% —— ₹5400
9 Chair —— ₹5400
∴ 3 Chair —— ₹1800

189. (a) $\frac{\text{Price}_1}{Q_1(100\pm P_1/L_1)\%} = \frac{\text{Price}_2}{Q_2(100\pm P_2/L_2)\%}$

$$\frac{160}{90\times80\%} = \frac{96}{Q_2\times120\%}$$

Q_2 = 36

190. (b) $\frac{\text{Price}_1}{Q_1(100\pm P_1/L_1)\%} = \frac{\text{Price}_2}{Q_2(100\pm P_2/L_2)\%}$

$$\frac{3}{7\times100\%} = \frac{\text{Price}_2}{100\times133\%}$$

Price_2 = ₹57

191. (a) $\frac{\text{Price}_1}{Q_1(100\pm P_1/L_1)\%} = \frac{\text{Price}_2}{Q_2(100\pm P_2/L_2)\%}$

$$\frac{405}{3\times75\%} = \frac{288}{Q_2\times120\%}$$

$Q_2 = \frac{4}{3}$ dozen

$Q_2 = \frac{4}{3}\times12$ = 16 Oranges

192. (b) $\frac{\text{Price}_1}{Q_1(100\pm P_1/L_1)\%} = \frac{\text{Price}_2}{Q_2(100\pm P_2/L_2)\%}$

$$\frac{1}{32\times60\%} = \frac{1}{Q_2\times120\%}$$

Q_2 = 16

193. (b) $\frac{1}{4\times96\%} = \frac{1}{3\times(100\pm P_2)\%}$

100 + P_2 = 128

P_2 = 28%

194. (b) $\frac{160}{70\times80\%} = \frac{96}{Q_2\times120\%}$

Q_2 = 28 Articles

195. (d) $\frac{11664}{18\times90} = \frac{17424}{Q_2\times110}$

Q_2 = 22 Table

196. (b) P = 33% ⇒ $\frac{SP}{CP} = \frac{133}{100}$

L = 20% ⇒ $\frac{SP}{CP} = \frac{80}{100} = \frac{4}{5}$

ATQ,

$$A\times\frac{133}{100}\times\frac{4}{5} = 532 \Rightarrow A = ₹500$$

197. (a) $10\% = \frac{1}{10}, 60\% = \frac{3}{5}, 12.5\% = \frac{1}{8}$

Cost price of D = Rs. 59.40

ATQ,

$$A\times\frac{11}{10}\times\frac{8}{5}\times\frac{9}{8} = \frac{594}{10}$$

⇒ A = 30

Alternate Method:

A B C D
CP → 100 : 110 : 176 : 198
×0.3 10%↑ 60%↑ $12\frac{1}{2}\%$↑ ×0.3
$\boxed{30}$ 59.40

198. (b) Let, cost price of bike for A = x

ATQ,

$$x\times\frac{145}{100}\times\frac{130}{100} = 43355$$

$$\Rightarrow x = \frac{43355\times400}{29\times26} = ₹23000$$

199. (a) $25\% = \frac{1}{4}$; $20\% = \frac{1}{5}$

Let, CP of the laptop for P = x

$$\therefore x\times\frac{3}{4}\times\frac{6}{5} = 22,500$$

$$\Rightarrow x = 22500\times\frac{4}{3}\times\frac{5}{6}$$

⇒ x = 25000

Alternate Method:-

CP : SP
I^{st} year → 4 : 3
IInd year → 5 : 6
20 : 18
×1250 ×1250
25000 22500

CP of laptop for P = ₹25000

200. (c) 10% loss = $\frac{9}{10}$

25% profit = $\frac{5}{4}$

ATQ,

$CP \times \frac{9}{10} \times \frac{5}{4} = 2250$

$\Rightarrow CP = 2250 \times \frac{40}{45} = ₹2000$

201. (d) Let CP for Akash be x

$\Rightarrow x \times \frac{11}{10} \times \frac{6}{5} \times \frac{19}{20} = 62700$

$\Rightarrow x = \frac{62700 \times 1000}{66 \times 19} = 50000$

202. (b) Let the C.P of A = 100 unit & Profit = 25%

$\Rightarrow$ SP of A = CP of B = 125 unit

$\Rightarrow$ CP of C = CP of A × $\frac{130}{100}$

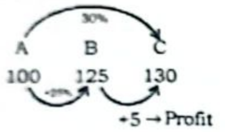
$= 100 \times \frac{130}{100} = 130$ unit

∴	A	B	C
C.P →	100	125	130

Profit earned by B = 130 − 125 = 5

Profit % = $\frac{5}{125} \times 100 = 4\%$

Alternate Method:



Profit % of B = $\frac{5}{125} \times 100\% = 4\%$

203. (c) $CP = \frac{9}{150} \times 100 = 6$

CP_N	:	SP_N
$6 \times \frac{125}{100}$	:	10
3	:	4

Profit % = $\frac{1}{3} \times 100 = 33\frac{1}{3}\%$

204. (c) Given,
Total no. of mangoes = 300
Cost price of all 300 mangoes = ₹1100
Total S.P of mangoes
= 1100 + 150 = ₹1250
S.P of each mangoes = ₹5
Then,

No. of selling mangoes = $\frac{1250}{5} = 250$

No. of thrown mangoes = 300 − 250 = 50

% of thrown mangoes

$= \frac{50}{300} \times 100 = 16\frac{2}{3}\%$

Alternate Method:-

No. of selling mangoes = $\frac{1100 + 150}{5}$

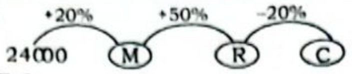
= 250

Rotten mangoes = 300 − 250 = 50

% of thrown mangoes = $\frac{50}{300} \times 100$

$= 16\frac{2}{3}\%$

205. (b)



A.T.Q.,

$24000 \times \frac{120}{100} \times \frac{150}{100} \times \frac{80}{100}$

= 288 × 120 = ₹34560

Note:- It can be done with the help of unit digit.

206. (d) After the additional cost, the CP of product = 10000 + 5000 = ₹15000
Distributor gets the product = ₹25000
Retailer gets the product

$= 25000 \times \frac{120}{100} = ₹30000$

Final SP = $30000 \times \frac{125}{100} = 37500$

∴ Profit % = $\frac{37500 - 15000}{15000} \times 100$

= 150%

207. (a) Let, total CP = 100
15 items went bad.
CP of Remaining items = 85
SP = 119

Profit% = $\frac{119 - 85}{85} \times 100\% = 40\%$

208. (b) Let $CP_1 = 400x$

$\Rightarrow CP_2 = 500x$ +10%

$S.P_1 = 440x$ +20%

$SP_2 = 600x$

ATQ,

$(600 - 440)x = 480 \Rightarrow x = \frac{480}{160} = 3$

∴ Difference in cost price of first and second articles

$= 500x - 400x = 100x$

= 100 × 3 = ₹300

SMART APPROACH:-

	A		B
CP	4	:	5 = 1 unit
	+10%		+20%
SP	4.4		6

1.6units → ₹480
Diff. in CP (5 − 4)
= 1 unit → ₹300

209. (b)

	A	:	B
Cost Price →	$300x$	:	$100x$
Selling price →	$270x$	:	$125x$

$145x = 5800$

$300x = \frac{5800}{145} \times 300 = 12000$

210. (c)

	A	:	B
CP →	400	:	500 = 900(Total)
	+10%		20%
SP →	440		600

Diff. = 160

30% of total CP = $\frac{480}{160} \times 900 \times \frac{30}{100}$

= 810

211. (d) Let the cost price of the article = x & profit% = x
SP = CP + P% of CP
$\Rightarrow 1200 = x + x\%$ of x

$\Rightarrow 1200 = x + \frac{x^2}{100}$

$\Rightarrow 120000 = 100x + x^2$
$\Rightarrow x^2 + 100x - 120000 = 0$
$\Rightarrow x^2 + 400x - 300x - 120000 = 0$
$\Rightarrow x(x + 400) - 300(x + 400) = 0$
$\Rightarrow (x + 400)(x - 300) = 0$
$\Rightarrow x = -400$ or $x = 300$

∵ Negative Value can not be considered as cost price.
Hence, Cost Price = ₹300

Alternate method:-
In such cases:
when P% = CP

Then, $CP = 10\left(\sqrt{25 + SP} - 5\right)$

$= 10\left(\sqrt{25 + 1200} - 5\right)$

$= 10(35 - 5) = 300$

SMART APPROACH:-
SP = CP + P% of CP
By option (d)

$SP = 300 + \frac{300 \times 300}{100}$

1200 = 300 + 900

212. (c) Let CP be x

$\frac{x(100 + x)}{100} = 131.25$

$\Rightarrow 100x + x^2 = 13125$
$\Rightarrow x^2 + 100x - 13125 = 0$
$\Rightarrow x^2 + 175x - 75x - 13125 = 0$
$\Rightarrow x(x + 175) - 75(x + 175) = 0$
$\Rightarrow (x - 75)(x + 175) = 0$
$\therefore x = 75$

$SP = 75 \times \frac{140}{100} = 105$

Alternate Method:
P% = CP

$CP = 10\left(\sqrt{25 + SP} - 5\right)$

$= 10\left(\sqrt{25 + 131.25} - 5\right) = 10(12.5 - 5)$

CP = 75

$\therefore SP_{new} = \frac{140}{100} \times 75 = 105$

213. (c) 20% = $\frac{-1}{5}$, 30% = $\frac{+3}{10}$

ATQ,

Selling price = $42000 \times \frac{4}{5} \times \frac{13}{10}$

= Rs.43680

∴ Profit = SP − CP = 43680 − 42000
= Rs.1680

214. (b) Let, total sugar = 50 kg

∵ $\frac{1}{5}$ Sugar goes to waste

So, waste sugar = 10 kg
Total cost of 50kg

$= 50 \times \frac{44.8}{112} \times 100 = Rs.2000$

∴ SP of 1 kg sugar = $\frac{2000 \times 105}{40 \times 100}$

= Rs.52.5

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Alternate Method:

Selling price for kg = $44.8 \times \frac{100}{112} \times \frac{5}{4} \times \frac{105}{100} = \frac{105}{2}$ = Rs.52.5

215. (d) Let, profit made by 2nd dealer = $x\%$

ATQ,

$$30 + x + \frac{30x}{100} = 40 \Rightarrow \frac{130x}{100} = 10$$

$$\Rightarrow x = \frac{100}{13} = 7\frac{9}{13}\%$$

216. (b) Let the C.P of the article = 100 units

$$\underbrace{\overset{CP}{100} \xrightarrow{+16\%} \overset{MP}{116} \xrightarrow{-12\%} \overset{SP}{102.08}}_{\substack{\text{Profit} \\ 2.08}}$$

$$\text{Profit } \% = \frac{2.08}{100} \times 100 = 2.08\%$$

217. (b)

$$\begin{tikzcd} \overset{A}{10000} \arrow[r, bend right, "+15\%"'] & \overset{B}{11500} \arrow[dl, bend left, "-15\%"] \\ 9775 & \end{tikzcd}$$

Total profit of Aarav = 11500 – 9775 = ₹1725

$$\therefore \text{Profit } \% = \frac{1725}{10000} \times 100 = 17.25\%$$

218. (b) $7.5\% \rightarrow \frac{3}{40} \downarrow$

Price → 40 : 37

Quantity → 37 : 40

$\times 5 \downarrow$ 3 unit → 15 kg.

1 unit → 5 kg.

185 kg.

$$CP = \frac{7400}{185} = ₹40/\text{kg}$$

$$SP = \frac{40 \times 132.5}{100} = ₹53/\text{kg.}$$

219. (c) Let the price of item = 100 unit

$$\underset{C.P.}{\boxed{100}} \xrightarrow{+15\%} \underset{SP_1}{\boxed{115}} \xrightarrow{-12\%} \underset{SP_2}{\boxed{101.20}}$$

$$C.P. \xrightarrow{+1.20\%} SP_2$$

Hence, effective percentage increase in the price of item = 1.2%

Alternate Method:

$$\text{Eff. } \% = 15 - 12 - \frac{15 \times 12}{100}$$

$$= 3 - 1.8\% = 1.2\%$$

220. (b) $12\% = \frac{-3}{25}\Big)$, $16\% = \frac{-4}{25}\Big)$

$$\text{CP of dealer} = 250 \times \frac{22}{25} \times \frac{21}{25}$$

Spend 10% of CP on transportation

$$10\% = \frac{1}{10} \Rightarrow \frac{11}{10}$$

$$\text{CP of article} = 250 \times \frac{22}{25} \times \frac{21}{25} \times \frac{11}{10}$$

$$\text{SP after earn a profit of } 25\% = \frac{1}{4}\Big) \frac{5}{4}$$

$$SP = 250 \times \frac{22}{25} \times \frac{21}{25} \times \frac{11}{10} \times \frac{5}{4} = 254.10$$

221. (b)

$$\begin{array}{lcl} & CP : SP & & CP : SP \\ I \rightarrow & 100 : 108_{\times 97.2} & \Rightarrow & I \rightarrow 19400 : 20952 \\ II \rightarrow & 100 : 97_{\times 108} & & II \rightarrow 10800 : 10476 \end{array}$$

Total CP = 19400 + 10800 = 30200

Total CP = 20952 + 10476 = 31428

$$P\% = \frac{1228}{30200} \times 100 = 4.07\%$$

222. (b) Let, Total number of item = 100

Let, CP of 1 item = 10

Total CP = 1000

CP of items that did not go bad = 10 × 70 = 700

$$\text{Overall profit} = 1000 \times \frac{19}{100} = 190$$

S.P = 1000 + 190 = 1190

$$\text{Required\%} = \frac{1190 - 700}{700} \times 100$$

$$= \frac{490}{7} = 70\%$$

SMART APPROACH:-

Remaining which could not be sold

$$100\% - 30\% = 70 \xrightarrow{+49} 119$$

$$P\% = \frac{49}{70} \times 100 = 70\%$$

223. (a) Let price of article X be 'x' and price of article Y be $(x + 90)$

ATQ,

$$\frac{23}{100}x - \frac{13}{100}(x + 90) = 180$$

$$\Rightarrow x - 117 = 1800$$

$$\Rightarrow x = 1800 + 117 = 1917$$

$$\therefore \text{CP of Y} = x + 90 = 1917 + 90 = 2007$$

224. (d) Let the CP of the table = 100 unit

SP of the table = 135 unit

New SP of table = 112 unit

ATQ,

$$\text{New SP} = \frac{5670}{135} \times 112 = 4704$$

SMART APPROACH:-

$$\frac{5670}{135} \times 112$$

16 7

Only option (d) is multiple of 7

225. (b) Total SP = 1500 + 2800 + 3500 = 7800

$$\text{Total CP} = \left(\frac{1500}{5} \times 4\right) + \left(\frac{2800 \times 2}{1}\right) + \left(\frac{3500 \times 4}{5}\right)$$

= 1200 + 5600 + 2800 = 9600

$$\text{Loss\%} = \frac{9600 - 7800}{9600} \times 100$$

$$= \frac{18}{96} \times 100 = 18.75\%$$

226. (c) SP after 20% profit = ₹16800

Now, production cost increased by 20%

∴ New C.P = old S.P = ₹16800

$$\therefore \text{New S.P} = \frac{120}{100} \times 16800$$

= ₹ 20160

227. (b)

$$\begin{array}{lcc} & \text{Price} & \text{Quantity} \\ SP \rightarrow & 6 & 25 \\ & \downarrow \times 40 & \downarrow \times 40 \\ & 240 & 1000 \end{array}$$

CP = 320

$$\text{Loss } \% = \frac{320 - 240}{320} \times 100\% = 25\%$$

Alternate Method:-

CP of 1000 gm kismis = 320

$$\text{CP of 1 gm kismis} = \frac{320}{1000}$$

$$\text{CP of 25 gm kismis} = \frac{320}{1000} \times 25 = ₹8$$

$$\text{loss\%} = \frac{8 - 6}{8} \times 100 = 25\%$$

228. (b) $\text{Required } \% = 50 - 40 - \frac{50 \times 40}{100}$

= 10 – 20 = –10% = 10% loss

Alternate Method:-

$$\begin{tikzcd} \overset{CP}{100} \arrow[dr, bend right, "-10"'] & : & \overset{MP}{150} \arrow[dl, bend left, "-40\%"] \\ & 90(SP) & \end{tikzcd}$$

$$\text{Loss\%} = \frac{10}{100} \times 100 = 10\%$$

229. (c) ATQ,

10 boxes of 20 kg

Total weight = 200 kg

Each box CP = ₹2000

Total CP = ₹20000

Total CP after transportation = 20000 + 1000 = ₹21000

10 kg grapes were damaged, remaining = 190 kg

SP of 20 kg grapes = ₹2500

$$\text{SP of 190 kg grapes} = \frac{2500}{20} \times 190$$

= ₹ 23750

∴ Gain = 23750 – 21000= ₹2750

230. (c) Total number of selling bananas

$$= \frac{1200 + 396}{3.5} = \frac{1596}{7} \times 2$$

= 456 Bananas

Bananas which were thrown = 480 – 456 = 24

$$\text{Required } \% = \frac{24}{480} \times 100\% = 5\%$$

231. (b) $25\% = \frac{1}{4}+\Big) = \frac{5}{4} \begin{array}{l} \rightarrow MP \\ \rightarrow CP \end{array}$

ATQ,

$$\begin{tikzcd} \overset{CP}{4} & : & \overset{MP}{5} \arrow[ll, bend left, "1"] \end{tikzcd}$$

$$\text{Required } \% = \frac{1}{5} \times 100 = 20\%$$

For no profit no loss oil should be sell to 20% Less price than MP

232. (b) Let CP = x & SP = y

P = y − x

ATQ,

Profit becomes four times when SP is Doubled.

Thus, 2y − x = 4(y − x)

$\Rightarrow 2y - x = 4y - 4x \Rightarrow \frac{x}{y} = \frac{2}{3}$

Profit = y − x = 3 − 2 = 1

Initial Profit% $= \frac{1}{2} \times 100\% = 50\%$

∴Original profit% = 50%.

Alternate Method:-

P = SP − CP —— (I)

$\underset{-}{4P} = \underset{-}{2SP} \underset{+}{-} CP$ —— (II)

−3P = − SP

$\Rightarrow \frac{P}{SP} = \frac{1}{3}$

⇒ CP = 3 − 1 = 2

∴ Profit % $= \frac{1}{2} \times 100 = 50\%$

233. (b) Profit% = 20%

CP of 6 cold drinks = ₹100

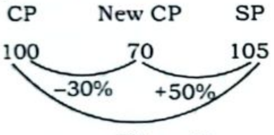
Now SP of 6 cold drinks

$= \frac{100 \times 120}{100} =$ ₹120

Then,

∴ SP of one bottle $= \frac{120}{6} =$ ₹ 20

234. (d) Let, the Original Price of cell phone be 100



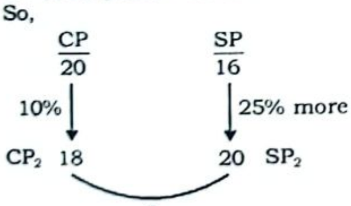
+5% profit

Profit% $= \frac{5}{100} \times 100 = 5\%$

235. (b) Given,

CP of 20 pens = 20 Rs.

So,



Profit % $= \frac{2}{18} \times 100 = 11.11\%$

236. (a) ATQ,

Let CP of A = 100a

Let CP of B = 100b

SP of A = 115a

SP of B = 75b

100a + 100b = 2540 ....(i)

⇒ 115a − 75b = 109 ....(ii)

on solving (i) and (ii)

a = 10.6, b = 14.8

⇒ SP of A = 115 × 10.6 = ₹1219

⇒ SP of B = 75 × 14.8 = ₹1110

Loss = 2540 − (1219 + 1110) = ₹211

Loss% $= \frac{211}{2540} \times 100$

= 8.3% (Approx)

Alternate Method:-1

Let, the cost price of article A = x

B = (2540 − x)

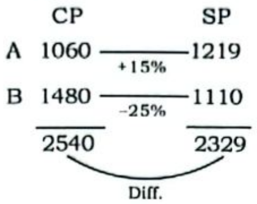
ATQ,

$\Rightarrow \frac{x \times 115}{100} - \frac{(2540 - x) \times 75}{100} = 109$

⇒ 115x − 2540 × 75 + 75x = 10900

⇒ 19x = 1090 + 254 × 75

$\Rightarrow x = \frac{20140}{19} = 1060 = A$



Loss% $= \frac{211}{2540} \times 100 = 8.3\%$

Alternate Method:-2

Let, CP of A = A

CP of B = B

ATQ,

A + B = 2540 .....(i)

also, $\frac{115}{100}A - \frac{75}{100}B = 109$

⇒ 115A − 75B = 10900 ....(ii)

Solving (i) and (ii)

A = 1060, B = 1480

$SP_A = \frac{115}{100} \times 1060 = 1219$

$SP_B = \frac{75}{100} \times 1480 = 1110$

Total SP = 2329

Total CP = 2540

Loss% $= \frac{211}{2540} \times 100 = 8.3\%$

237. (b) ATQ,

	CP	SP
A →	100	76
B →	100	?

(A + B) 200 $\xrightarrow{+12\%}$ 224

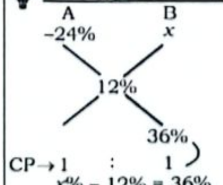
(224 − 76) = 148 (SP of B)

(148 − 76) = 72 unit

72 unit = 270 Rs.

148 unit = 555 Rs.

SMART APPROACH:-



x% − 12% = 36%

x = 48%

Given, that

(148 − 76)% = 270

72% = 270

SP of article B $= \frac{270}{72} \times 148$

= Rs.555

238. (c) $\frac{2}{5} \times MP = \frac{5}{8} \times SP$

$\Rightarrow \frac{MP}{SP} = \frac{25}{16}$

∴ Discount% $= \frac{25 - 16}{25} \times 100\% = 36\%$

239. (c) CP of 2 dozen banana = ₹30

$\Rightarrow SP_1 = \frac{15}{12} \times 12 =$ ₹15

$\Rightarrow SP_2 = \frac{9}{12} \times 5 =$ ₹3.75

Total SP = 15 + 3.75 = 18.75

Loss% $= \frac{30 - 18.75}{30} \times 100 = 37.5\%$

240. (c) SP $= 30 \times x \times \frac{110}{100} = [8 \times x + (x - 8)45]$

⇒ 330x = 80x + 450x − 3600

⇒ 3600 = 200x

⇒ x = 18kg

So, Ritika sold wheat at ₹45/kg

= 18 − 8 = 10kg

241. (b)

C.P	S.P		Profit
5,000	6,000	=	1,000
8,000	10,000	=	2,000
13,000			3,000

∴ Profit% $= \frac{3,000}{13,000} \times 100 = 23.08\%$

242. (b) 30% $= \frac{3}{10}$

ATQ,

	C.P	:	S.P
Trader-I →	10	:	13
Trader-II →	10	:	13
Trader-III →	10	:	13
	1000	:	2197
	↓		↓
	$\boxed{136.55}$		300

243. (a) Ist IInd

20% 25%

Successive profit

$= 20 + 25 + \frac{25 \times 20}{100} = 50\%$

Let IIIrd profit be x%

$\Rightarrow 50 + x + \frac{50x}{100} = 65 \Rightarrow \frac{3x}{2} = 15$

⇒ x = 10%

SMART APPROACH:-

↑20% → 5 : 6

↑25% → 4 : 5

$x : y$

↑65% → 20 : 33

$\frac{20x}{30y} = \frac{20}{33} \Rightarrow x : y = 10 : 11$

Profit=10% %

244. (c) S.P in Hyderabad = ₹M

S.P in Madras $= \frac{3}{4}$M

ATQ,

$\Rightarrow \left(\frac{3}{4}M + 1000\right)\frac{110}{100} = M$

$$\Rightarrow \left(\frac{3}{4}M + 1000\right)\frac{11}{10} = M$$

$$\Rightarrow \frac{33}{40}M + 1100 = M \Rightarrow \frac{7}{40}M = 1100$$

$$\therefore M = \frac{44000}{7} = 6285.7$$

245. (c) Let the CP of the article = 100%
There is a loss of 45% while selling the article at $\frac{3}{8}$ of SP

$$SP = 100 \times \frac{55}{100} = 55$$

As the product is sold at $\frac{3}{8}$ of the original SP $= \frac{8}{3} \times 55 = 147$

$$\text{Profit \%} = \frac{147 - 100}{100} \times 100\% = 47\%$$

Alternate Method:

$$\downarrow 45\% = \frac{-9}{20}$$

$$\begin{array}{ccccc} CP_1 & & SP_2 & & SP_1 \\ & & 3 & & 8 \\ 20 & & 11 & & \\ \hline 60 & : & 33 & : & 88 \end{array}$$

$$\underbrace{60 \quad 88}_{+28}$$

$$\text{Profit \%} = \frac{28}{60} \times 100 = 47\%$$

246. (d)

$$\begin{array}{lcl} & CP & : & SP \\ & \frac{100}{105} \times 100 = \frac{2000}{21} & : & 100\text{(let)} \\ & 100 & : & 115 \end{array}$$

$$\% \text{ Change in CP} = \frac{100 - \frac{2000}{21}}{\frac{2000}{21}} \times 100$$

$$= \frac{100 \times 100}{2000} = 5\%$$

247. (d) R sells it to S for ₹560 at 40% profit

$$\therefore \text{CP for R} = \frac{560}{7} \times 5 = ₹400$$

$$\& \text{ CP for Q} = \frac{280}{4} \times 5 = ₹350$$

SP for Q = ₹400

Profit percentage of Q

$$= \frac{50}{350} \times 100 = 14\% \text{ (approx)}$$

Alternate Method:-1

$$\begin{array}{ccccccc} P & : & Q & & R & & S \\ 4 & : & 5 & & 5 & : & 7 \\ 70\times\downarrow & & \downarrow\times 70 & & \downarrow\times 80 & & \downarrow\times 80 \\ 280 & & 350 & & 400 & & 560 \end{array}$$

$$\underbrace{350 \quad 400}_{+50}$$

$$\text{Profit \%} = \frac{50}{350} \times 100 = 14\% \text{ (Approx)}$$

Alternate Method:-2

ATQ,

$$280 \times \frac{5}{4} \times \frac{(100 + x)}{100} \times \frac{7}{5} = 560$$

$$\Rightarrow 700 + 7x = 800$$

$$\Rightarrow x = \frac{100}{7} = 14\frac{2}{7}\% \sim 14\% \text{ (Approx)}$$

248. (a) CP = ₹48000

$$SP = 48000 \times \frac{85}{100} \times \frac{122 \cdot 5}{100} = ₹49{,}980$$

Profit = 1980

$$\text{Profit \%} = \frac{1980}{48000} \times 100 = 4.125\%$$

Alternate Method:

By successive method

$$P\% = 22.5 - 15 - \frac{22.5 \times 15}{100}$$

= 4.125%

Profit% = 4.125%

249. (a) Total CP = 45 × 20 + 50 × 25 + 40 × 35 + 450
= 900 + 1250 + 1400 + 450
= 4000

$$\text{CP of 1 kg} = \frac{4000}{80} = 50$$

SP of 1 kg = 52.5

$$\text{Profit\%} = \frac{(52.5 - 50)}{50} \times 100$$

$$= \frac{2.5}{50} \times 100 = 5\%$$

250. (c)

$$\begin{array}{lcc} & CP & & SP \\ X \rightarrow & 100 & & 120 \\ Y \rightarrow & 100 & & ? \\ (X + Y) & 200 & \xrightarrow{+14\%} & 228 \end{array}$$

(228 – 120) unit = 108 unit (SP of Y)

(120 – 108) unit = 12 unit

12 unit = 126

100 unit = ₹1050

251. (d) $\frac{1}{3}SP = \frac{2}{3}CP \Rightarrow \frac{SP}{CP} = 2$

When article is sold at 60% of original selling price then new SP = 2 × 60% = 1.2

$$\text{Profit \%} = \frac{0.2}{1} \times 100 = 20\%$$

Alternate Method:

$$33\frac{1}{3}\% = \frac{1}{3}$$

$$33\frac{1}{3}\% = \frac{-1}{3} = \frac{2}{3}$$

$$\begin{array}{ccccc} CP_1 & & SP_1 & & CP_2 \\ 3 & : & 1 & & \\ & & 2 & : & 3 \\ \hline 6 & : & 2 & : & 3 \end{array}$$

60% profit of 6 = 3.6

$$\text{Profit \%} = \frac{3.6 - 3}{3} \times 100 = 20\%$$

252. (d) Let, SP = 100

$$\begin{array}{ccc} SP & \text{Profit} & CP \\ 100 & 20 & 80 \\ \big\downarrow 8\%\uparrow & & \big\downarrow 10\%\uparrow \\ 108 & & 88 \end{array}$$

Diff. = 108 – 88 = 20 (New profit)

$$\text{Profit \%} = \frac{20}{88} \times 100 = 22.7$$

253 (a) 4% loss $= -\frac{1}{25}$

$$\begin{array}{ccc} CP & : & SP \\ 25 & : & 24 \\ 12\times(& &)12 \\ 300 & : & 288 \\ CP & : & MP \\ 300 & : & 315 \end{array}$$

$$\underbrace{300 \quad 315}_{15}$$

$$\text{Profit \%} = \frac{15}{300} \times 100 = 5\%$$

SPEED BOOSTER HACKS

◆ Square of numbers, ends on 5◆

$\Rightarrow (x5)^2 = x(x + 1)/25$

Ex:

(i) $(65)^2 = (6 \times 7)/25 = 4225$

(ii) $(75)^2 = (7 \times 8)/25 = 5625$

(iii) $(95)^2 = (9 \times 10)/25 = 9025$

(iv) $(105)^2 = (10 \times 11)/25 = 11025$

(v) $(115)^2 = (11 \times 12)/25 = 13225$

◆ Do it Yourself ◆

(i) $(35)^2$ = ………………

(ii) $(115)^2$ = ………………

(iii) $(55)^2$ = ………………

(iv) $(145)^2$ = ………………

(v) $(85)^2$ = ………………

(vi) $(155)^2$ = ………………

03
Chapter

DISCOUNT

◆ TYPE – I ◆
BASIC QUESTIONS

1. In a clearance sale, a sari whose marked price was ₹10,490 is now sold for ₹9,441. What is the discount percentage on the sari?
SSC CGL 09/09/2024 (Shift-03)
(a) 10% (b) 15%
(c) 18% (d) 12%

2. In a store, an item with marked price of ₹82,500 is available at a discounted price of ₹79,200. What is the percentage of discount given on that item?
SSC CPO 27/06/2024 (Shift-03)
(a) 4% (b) 3%
(c) 1% (d) 2%

3. A coat marked at Rs. 145 is offered at Rs. 127.6. The rate of retail discount offered is:
SSC CHSL 10/07/2024 (Shift-03)
(a) 11% (b) 12%
(c) 10% (d) 13%

4. The marked price of a table lamp is Rs.2,165. During the festive season, it is sold for Rs.1,710.35. Find the percentage discount offered.
SSC CHSL 11/07/2024 (Shift-04)
(a) 21% (b) 20.5%
(c) 18% (d) 22.5%

5. A merchant advertise 10% off on the items bought from his store. Find the discount got by a customer who bought a bag worth ₹560, an exercise book worth ₹90 and a pen worth ₹45.
SSC CHSL 04/08/2023 (Shift-02)
(a) ₹59 (b) ₹69.50
(c) ₹65 (d) ₹67.50

6. The marked price of an electronic watch in a store is Rs.15,620 and it is available at a discount of 27%. What is the price (in Rs., to the nearest tens) that a customer pays if he buys from the store?
SSC CGL 26/09/2024 (Shift-02)
(a) ₹12,500 (b) ₹11,400
(c) ₹9,880 (d) ₹10,880

7. The marked price of an immersion rod in an electronic store is ₹900. The store offers a discount of 12% on its sale. At what price (in ₹) can a customer buy it from the electronic store?
SSC CPO 29/06/2024 (Shift-02)
(a) 787 (b) 792
(c) 782 (d) 797

8. At a clearance sale, a shopkeeper gives 45% discount. If a customer paid ₹330 during the sale, then what is the marked price of that shirt ?
SSC CGL TIER-II 07/03/2023
(a) ₹550 (b) ₹600
(c) ₹500 (d) ₹650

9. If the selling price of an article is ₹1,792 after a 20% discount, then the marked price of the article is:
SSC CGL 18/09/2024 (Shift-03)
(a) ₹2,140 (b) ₹2,240
(c) ₹2,160 (d) ₹2,260

10. A shopkeeper announced 17% rebate on the marked price of an article. If the selling price of the article is ₹1,245, then the marked price (in ₹) of the article is :
SSC Phase XII 25/06/2024 (Shift-04)
(a) 1500 (b) 1820
(c) 1780 (d) 1600

11. The marked price of one pen is ₹x. The selling price of one packet of x pens, after a discount of 15%, is ₹1,360. What is the value of 'x' ?
SSC MTS 12/07/2022 (Shift-02)
(a) 20 (b) 40
(c) 30 (d) 45

12. The MP of an article was Rs.180 and it was sold at a discount of 15%, the discount in Rs. is:
SSC CGL 12/09/2024 (Shift-02)
(a) 12 (b) 15
(c) 27 (d) 18

13. On the occasion of Republic Day, a retail store offers a scheme where customers can avail a discount of 26% on their total purchase. If Manish buys items worth Rs.2,050, how much money (in) will he save through the scheme discount?
SSC CGL TIER-II (18/01/2025)
(a) 533 (b) 544
(c) 522 (d) 511

14. A shopkeeper has announced a 25% rebate on the prices of stationery items. If anyone needs to have a rebate of ₹40, then how many stationery items costing ₹32 should be purchased?
SSC CHSL, 14/08/2023 (Shift-04)
(a) 5 items (b) 6 items
(c) 4 items (d) 3 items

15. Lakshita purchased a sofa set at discount of 25%. As per her calculations, she noticed that if she would have not been given this discount, she would have paid ₹22,400 more as the cost of this sofa set. How much did Lakshita pay for the sofa set?
SSC CHSL 10/08/2023 (Shift-02)
(a) ₹22,400 (b) ₹33,600
(c) ₹67,200 (d) ₹67,000

16. A seller marks up his goods at 40% over the cost price. If the difference between the profits if he allows a 15% discount on the marked price and if he allows a discount of 20% on the marked price is ₹94.85, find the cost price (in ₹).
CRPF HCM 11/03/2023 (Shift- 02)
(a) 1295 (b) 1326
(c) 1355 (d) 1254

◆ TYPE – II ◆
BUY X GET Y FREE

17. Murlidhar, the owner of a grocery store, offers a discount scheme 'buy 5 water bottles get 1 for free' to his customers. What is the effective percentage discount offered by Murlidhar? (correct up to two decimal places)
SSC CGL TIER-II (20/01/2025)
(a) 13.67% (b) 20.00%
(c) 13.33% (d) 16.67%

18. During a new-year sale, a shopkeeper offers a discount scheme to his customers, 'Buy 5 Sweaters, Get 2 Sweaters Free'. Find the effective percentage discount given by the shopkeeper.
(a) $28\frac{4}{7}\%$ (b) 25%
(c) $22\frac{2}{9}\%$ (d) 21%

19. On buying 24 bangles Meena gets 6 bangles free of cost. By what percentage does Meena get a discount?
SSC CHSL 08/07/2024 (Shift-04)
(a) 15% (b) 5%
(c) 20% (d) 10%

20. To clear the old stock, Arshad offers a discount scheme to his customers - on buying 24 glass tumblers get 12 glass tumblers free. What is the effective percentage discount given by Arshad to his customers?
SSC CHSL 08/07/2024 (Shift-02)
(a) $32\frac{2}{3}\%$ (b) $30\frac{1}{3}\%$
(c) $34\frac{2}{3}\%$ (d) $33\frac{1}{3}\%$

21. What is the effective discount percentage if a shopkeeper offers a scheme discount 'buy five and get one free'?
SSC CHSL 02/07/2024 (Shift-02)
(a) 16.33% (b) 16.67%
(c) 15.33% (d) 15.67%

22. A shopkeeper offers the following two discount schemes.
A. Buy 3 get 4 free
B. Buy 5 get 6 free
Which scheme has the maximum discount percentage?
SSC CGL 14/07/2023 (Shift-01)
(a) A
(b) A does not give any discount
(c) A and B both have the same discount percentage
(d) B

• TYPE – III •
EQUIVALENT DISCOUNT OF TWO SUCCESSIVE DISCOUNTS

23. Two successive discounts of 40% and 30% are equal to a single discount of:
SSC CGL 10/09/2024 (Shift-02)
(a) 70%
(b) 35%
(c) 58%
(d) 60%

24. A single discount equivalent to two successive discount of 20% and 10% on the marked price of an article is?
SSC CHSL 01/06/2022 (Shift- 03)
(a) 18%
(b) 28%
(c) 24%
(d) 22%

25. If the successive discount of 10%, 15%, then the single equivalent rate of discount is:
SSC CGL 13/09/2024 (Shift-01)
(a) 32.3%
(b) 24.2%
(c) 43.4%
(d) 23.5%

26. A discount series of 10% and 16% on an invoice is the same as a single discount of:
SSC CGL 13/09/2024 (Shift-02)
(a) 24.4%
(b) 22.4%
(c) 21.4%
(d) 23.4%

27. A shopkeeper allows 40% discount on his goods. He further gives 20% discount. What is the single discount equivalent to these two successive discounts?
SSC CGL 17/09/2024 (Shift-02)
(a) 62%
(b) 52%
(c) 60%
(d) 50%

28. A person first increases the price of a commodity by 8% and then he announces a discount of 18%. The actual discount (in%) on the original price is?
SSC CGL 26/09/2024 (Shift-01)
(a) 11.44
(b) 14.44
(c) 9.44
(d) 8.44

29. The marked price of an article is ₹50,000. From three shopkeepers, the first one allows two successive discounts of 25% and 15%. The second one allows two successive discounts 20% and 20%. The third shopkeeper allows two successive discounts of 30% and 10%. From which shopkeeper does the customer get more profit?
SSC CGL 25/07/2023 (Shift-02)
(a) First
(b) Same for all the shopkeepers
(c) Third
(d) Second

30. A shopkeeper offers the following discount schemes for buyers on an article:
I. Two successive discounts of 15% each
II. A discount of 25% followed by a discount of 5%
III. Two successive discounts of 20% and 10%
IV. A discount of 30%
Under which scheme will the selling price be maximum?
SSC CGL 17/07/2023 (Shift-01)
(a) Scheme IV
(b) Scheme III
(c) Scheme II
(d) Scheme I

31. A trader offers the following discount schemes on the purchase of a refrigerator.
(i) A discount of 10% followed by a discount of 8%
(ii) Successive discounts of 12% and 10%
(iii) Two successive discounts of 12%
(iv) A discount of 20%
in which scheme is the selling price the lowest?
SSC CGL 23/09/2024 (Shift-01)
(a) (iv)
(b) (i)
(c) (ii)
(d) (iii)

32. A shopkeeper offers the following discount schemes for buyers.
I. Two successive discounts of 15% and 20%
II. successive discount of 25% and 10%
III. A discount of 33%
The selling price will be minimum under the scheme:
SSC CGL 18/09/2024 (Shift-01)
(a) I
(b) I or II
(c) III
(d) II

33. A shopkeeper offers 3 schemes of discounts to his customers. Which of the following schemes will fetch the minimum discount percentage?
(A) Two successive discounts of 24% and 27%.
(B) Buy 5 get three free.
(C) Buy 6 and get 10.
SSC CPO 27/06/2024 (Shift-01)
(a) A
(b) C
(c) Both A and C
(d) B

34. Which of the following schemes will yield maximum discount on purchase of ₹x?
(1) 2 successive discounts of 25% and 15%
(2) Single discount of 20%
(3) 2 free on purchase of 3 items
(4) 3 free on purchase of 7 items
SSC Phase XII 20/06/2024 (Shift-03)
(a) Scheme 2
(b) Scheme 3
(c) Scheme 4
(d) Scheme 1

35. A shopkeeper offers the following discount schemes for the purchase of his goods. Find the schemes which has the maximum discount.
(i) Two successive discount of 20% and 10%
(ii) Discount of 10%
(iii) Buy 8 and get 4 free
(iv) Buy 9 and get 6 free
SSC CHSL 07/08/2023 (Shift-02)
(a) (iii)
(b) (ii)
(c) (i)
(d) (iv)

36. A shopping mart offers four different discounts schemes on the sale of an object as follows:
(1) A discount of 30%
(2) Two successive discounts of 15%
(3) Buy 2, get 1 free
(4) Buy 5, get 3 free
Which discount scheme offers the maximum discount to a customer?
SSC CGL 24/07/2023 (Shift-03)
(a) 1
(b) 4
(c) 2
(d) 3

37. Kamlesh offers the following two discount schemes to his customers on the sale of an article:
(i) Two successive discounts of 25% and 5%
(ii) Two successive discounts of 20% and 10%
What is the difference between the selling price (Rs. in) of the article under these two discount schemes if its marked price is Rs. 1,000?
SSC CHSL 04/07/2024 (Shift-02)
(a) 6.5
(b) 8.0
(c) 7.5
(d) 7.0

38. Marked price of an article is ₹28000. It can be sold at one of the following ways:
Way A : A single discount of 24 percent.
Way B : Two successive discounts of 16 percent and 10 percent.
Which way will have lowest selling price and what will be the value of it?
SSC CGL TIER- II 08/08/2022
(a) Way B, ₹21168
(b) Way B, ₹21280
(c) Way A, ₹21168
(d) Way A, ₹21280

39. A shopkeeper offers the following two discount schemes on the sale a watch having marked price ₹3,600.
(1) Two successive discounts of 15%.
(2) A discount of 10% followed by a discount of 20%.
What is the difference between the selling price of the watch in case (1) and case (2)?
SSC Phase-X 04/08/2022 (Shift-02)
(a) ₹11
(b) ₹9
(c) ₹8
(d) ₹10

40. A shopkeeper offers three schemes as given below to sell a particular type of product. Which of the following schemes offer(s) the maximum discount percentage?
A. Buy 6, get 4 free
B. Buy 5, get 5 free
C. Two successive discounts of 18% and 24%
SSC CGL 20/07/2023 (Shift-02)

(a) Only B (b) Only B and C
(c) Only A and C (d) Only A

41. A retailer offers the following discount schemes for buyers on an item.
(i) Two successive discount of 20%.
(ii) A discount of 25% followed by a discount of 15%.
(iii) A discount of 40%.
Under which scheme will the selling price be minimum?
SSC Phase-X 05/08/2022 (Shift-03)
(a) (i) and (ii) (b) (iii)
(c) (ii) (d) (i)

42. The company offers the following four types of successive discounts on a computer which is listed at ₹ 6000.
(i) 25% and 15%
(ii) 30% and 10%
(iii) 35% and 5%
(iv) 20% and 20%
Which of these offers is best for a customer?
SSC CHSL 08/08/2023 (Shift-01)
(a) Fourth offer (b) First offer
(c) Third offer (d) Second offer

43. A trader offers to sell a commodity under any of the two schemes mentioned below:
Scheme 1: The trader offers two successive discounts of 20% and 12.5% on the sale of each unit.
Scheme 2: The trader offers the buyer an option to 'pay for y units, get z units free'.
The buyer realizes that if he needs to buy (y+z) units, it does not matter to him which of the two schemes he opts for.
Which of the following options gives a correct ordered pair of (y, z)?
SSC Phase-XI 28/06/2023 (Shift-02)
(a) (3, 7) (b) (7, 10)
(c) (10, 7) (d) (7, 3)

44. If, on a marked price, the difference between selling prices with a discount of 65% and with two successive discounts of 30% and 40% is ₹105, then the marked price (in ₹) is:
SSC CGL 10/09/2024 (Shift-01)
(a) Rs.1,650 (b) Rs.1,050
(c) Rs.1,500 (d) Rs.1,320

45. The difference between a discount of 25% and two successive discounts of 15% and 20% on a certain bill was Rs.28. Find the amount of the bill ?
SSC CGL 12/09/2024 (Shift-03)
(a) Rs.500 (b) Rs.400
(c) Rs.450 (d) Rs.550

46. The difference (in Rs) between a discount of 37% on Rs 2,635 and two successive discounts of 23% and 7% on the same amount is (rounded off to 2 decimal places):
SSC CHSL 05/07/2024 (Shift-04)
(a) 248.36
(b) 226.87
(c) 235.65
(d) 242.25

47. Applied to a bill for ₹1000, what is the difference between a discount of 40% and two successive discounts of 36% and 4%?
SSC CPO 28/06/2024 (Shift-02)
(a) ₹154 (b) ₹144
(c) ₹15.40 (d) ₹14.40

48. A discount of 27% on a certain bill, and the difference between two successive discounts of 20% and 10% was ₹56. Find the amount of the bill.
SSC CHSL TIER - II 10/01/2024
(a) ₹5,600 (b) ₹1,120
(c) ₹1,866 (d) ₹5,500

49. For an electric bill for ₹ 50,000, what is the difference between a discount of 30% and two successive discounts of 26% and 5%?
SSC CHSL TIER - II 02/11/2023
(a) ₹150 (b) ₹140
(c) ₹130 (d) ₹120

• TYPE – IV •
EQUIVALENT DISCOUNT OF THREE SUCCESSIVE DISCOUNTS

50. The single discount equivalent to a series discount of 60%, 70% and 80%.
SSC CGL 23/09/2024 (Shift-03)
(a) 97.6% (b) 70%
(c) 85% (d) 95.5%

51. The single discount equivalent to the discount series of 15%, 20% and 5% is:
SSC CGL 25/09/2024 (Shift-03)
(a) 35.4% (b) 20%
(c) 32% (d) 32.5%

52. A shopkeeper wanted to sell ₹2,000 worth of products. But he had two options, giving three successive discounts of 10% each or giving a single discount of 28%. What was the difference between the two options of discounts (in rupees)?
SSC CPO 29/06/2024 (Shift-01)
(a) 28 (b) 18
(c) 16 (d) 22

53. Find a single discount equivalent to the successive discount of 12%, 20%, 24% and 32%. (Correct to two places of decimals)
SSC Phase XII 20/06/2024 (Shift-01)
(a) 43.41% (b) 73.71%
(c) 63.62% (d) 53.51%

54. What is the single discount equivalent to the successive discounts of 20%, 35%, and 10%?
SSC CGL TIER - II 26/10/2023
(a) 53.2% (b) 48.7%
(c) 65.4% (d) 42.3%

55. If successive discounts of 5%, 10% and p% are equivalent to a single discount of 31.6%, then the value of p is:
SSC CGL 21/07/2023 (Shift-01)
(a) 15 (b) 25
(c) 20 (d) 30

• TYPE – V •
SERIES CONCEPT

56. The marked price of a bed sheet is Rs.500. At the time of its sale, two successive discounts of 10% and 5% are available. Find the selling price (in Rs.) of the bed sheet?
SSC CGL 23/09/2024 (Shift-02)
(a) Rs.432.50 (b) Rs.427.50
(c) Rs.445.00 (d) Rs.430.00

57. The marked price of a revolving chair is Rs.15,000. It is available on two successive discounts of 20% and 12%. What is its selling price (in Rs.)?
SSC CGL 24/09/2024 (Shift-01)
(a) Rs.9560 (b) Rs.10560
(c) Rs.9230 (d) Rs.10230

58. The marked price of a washing machine is ₹25,000 and it is available with two successive discounts of 12% and 10%. Find its final price for a customer.
SSC Phase X 03/08/2022 (Shift- 02)
(a) ₹20,000 (b) ₹19,500
(c) ₹19,800 (d) ₹19,000

59. The marked price of a TV set is Rs.18,500. If the dealer allows two successive discounts of 20% and 5%, for how much is the TV available?
SSC CGL 17/09/2024 (Shift-03)
(a) ₹14,000 (b) ₹15,000
(c) ₹15,060 (d) ₹14,060

60. The marked price of a battery-operated rickshaw is Rs 90,000. It is available for sale at two successive discounts of 10% and 5%. What is the selling price (in Rs) of the battery-operated rickshaw?
SSC CHSL 08/07/2024 (Shift-02)
(a) 78,950 (b) 77,850
(c) 76,950 (d) 75,850

61. The marked price of a grinder was ₹3,000, and the dealer offered successive discounts of 20% and 15% on it. For how much did he sell the grinder?
SSC Phase XII 20/06/2024 (Shift-02)
(a) ₹2,040 (b) ₹2,000
(c) ₹2,200 (d) ₹2,400

62. Ramesh gives 15% additional discount along with a discount of 25% on the marked price of a sofa set. If the selling price of the sofa set is ₹12,750, then find the marked price of the sofa set.
SSC CPO 04/10/2023 (Shift-03)
(a) ₹22,000 (b) ₹23,000
(c) ₹24,000 (d) ₹20,000

63. A shopkeeper charges ₹1.50 to photocopy a sheet of paper and a discount of 5.5% is given on all photocopies done after 400 sheets. How much will it cost to photocopy 800 sheets of paper?
SSC CHSL 19/04/2021 (Shift-03)
(a) ₹1,160 (b) ₹1,167
(c) ₹1,276 (d) ₹1,176

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64. On an item, there is an 18% discount on the marked price of ₹26,000. After giving an additional season's discount, the item is sold at ₹16,000. How much was the season's discount correct upto two places of decimal?

SSC CPO 04/10/2023 (Shift-03)

(a) 24.95% (b) 22.45%
(c) 24.65% (d) 35.25%

65. If the price item is increased by 70% and then allows a scheme discount of 5% and 20% on this marked price. If price is paid in cash and additional discount of 20% is allowed then what is his gain percentage?

SSC CPO 03/10/2023 (Shift-01)

(a) 2.25% (b) 3.25%
(c) 4.36% (d) 3.36%

66. The list price of a hand mixer at a showroom is Rs 2,000 and it is being sold at successive discounts of 15% and 10%. What is its net selling price in rupees?

SSC CHSL 08/07/2024 (Shift-01)

(a) 1,530 (b) 1,560
(c) 1,440 (d) 1,600

67. A doll is marked for ₹2,500. A customer pays ₹1,800 for it. If the customer got a series of two discounts and the rate of the first discount is 10%, then the rate of the second discount is:

SSC CPO 27/06/2024 (Shift-02)

(a) 25% (b) 18%
(c) 15% (d) 20%

68. A shopkeeper, on the eve of Diwali, allowed a series of discounts on television sets. Find the selling price of a television set, if the marked price of television is Rs.1,200 and successive discounts are 15% and 10%.

SSC CGL 11/09/2024 (Shift-01)

(a) Rs.945 (b) Rs.918
(c) Rs.975 (d) Rs.965

69. Successive discounts of 10% and 20% are given on the purchase of a purse. If the marked price of the purse is Rs.2,250, find the selling price.

SSC CGL 19/09/2024 (Shift-01)

(a) Rs.1320 (b) Rs.1620
(c) Rs.1290 (d) Rs.1520

70. A shopkeeper gives a discount of 24% on the marked price. On a special sale day, he offers a coupon of additional 30% discount after the first discount. If the item is sold for ₹ 7,700.70, what is the marked price (in ₹) of the item?

SSC CPO 29/06/2024 (Shift-01)

(a) 14475 (b) 17475
(c) 14745 (d) 17745

71. A product was offered at a 10% trade discount on the marked price. After a cash discount of 10%, the product was sold for ₹7,290. The marked price (in ₹) is:

SSC CPO 27/06/2024 (Shift-03)

(a) 9,000 (b) 8,900
(c) 8,510 (d) 8,720

72. The price of one shirt is ₹700 in a shop, on which 10% discount is available for all customers. An additional 20% discount is there for the customers who pay in cash. What is the amount a customer has to pay for a shirt if he pays in cash?

SSC CPO 10/11/2022 (Shift-02)

(a) ₹ 432 (b) ₹ 504
(c) ₹ 523 (d) ₹ 514

73. A vendor bought a book marked at ₹850 at successive discounts of 20% and 10%, respectively. He spent ₹55 on transport and sold the book for ₹980. What will be his profit percentage (rounded off to 2 decimal places)?

SSC CPO 03/10/2023 (Shift-03)

(a) 46.93% (b) 50.65%
(c) 48.25% (d) 45.65%

74. After offering two successive discounts a toy with a marked price of ₹150 is sold at ₹105. If the value of the first discount is 12.5%, what is the value of the second discount?

SSC CGL 18/09/2024 (Shift-02)

(a) 21% (b) 18%
(c) 20% (d) 22%

75. An article is sold for Rs.747 after successive discounts of 17% and x%. If the marked price of the article is Rs.1,600, what is the value of x?

SSC CGL 24/09/2024 (Shift-02)

(a) 32.26 (b) 43.75
(c) 22.12 (d) 40.28

76. An electronic store owner allows two successive discounts of 20% and 25% on each item. The store has a reward points scheme which enables a customer to get free shopping worth ₹0.10 on every 1 reward point credited to the customer's account on previous purchases from the store. A customer decides to buy a laptop that is marked at ₹72,000. What will be its net selling price if he has 2850 reward points to his credit?

SSC CGL 14/07/2023 (Shift-02)

(a) ₹43,200
(b) ₹42,915
(c) ₹42,215
(d) ₹42,942

77. Two successive discounts, each of x% on the marked price of an article, are equal to a single discount of ₹331.20. If the marked price of the article is 920, then the value of x is:

SSC CPO 23/11/2020 (Shift-01)

(a) 20 (b) 18
(c) 15 (d) 25

78. The marked price of an article is ₹1500. If two successive discounts, each of x %, on the marked price is equal to a single discount of ₹587.40, then what will be the selling price of the article if a single discount of x% is given on the marked price?

SSC CGL TIER - II 13/09/2019

(a) ₹1025 (b) ₹1155
(c) ₹1170 (d) ₹1200

79. An article is listed at ₹7,600 and the discount offered unit is 10%. What additional discount must be given to bring the net selling price to 5814?

SSC CGL TIER - II 18/11/2020

(a) 10% (b) 8%
(c) 15% (d) 12%

80. After giving two successive discounts, each of x%, on the market price of an article , the total discount is ₹259.20 . If the marked price of the article is ₹720, then the value of x is :

SSC CGL 04/06/2019 (Shift- 01)

(a) 18 (b) 24
(c) 25 (d) 20

81. After getting two successive discounts, a calculator with a list price for ₹900 is available at ₹612. If the value of the second discount is 15%, what is the value of the first discount?

CISF HC 30/10/2023 (Shift-02)

(a) 20% (b) 10%
(c) 12.5% (d) 15%

82. Three shopkeepers A, B and C marked an identical article at ₹4820. A, B and C sold their article on successive discounts of 20% and 20%; 25% and 15%; 30% and 10% respectively. Which shopkeeper gives the maximum discount and how much (in ₹)?

SSC CGL 16/08/2021 (Shift-02)

(a) C, 1780 (b) A, 1735.20
(c) B, 1800 (d) C, 1783.84

83. At a factory outlet of a footwear company, every item is available at a discount of 10%. Charu selected footwear marked for ₹900. While paying the bill, it was found that the footwear was slightly damaged for which she got another discount of 10%. How much did she pay for the footwear?

SSC CHSL 16/04/2021 (Shift-03)

(a) ₹720 (b) ₹729
(c) ₹810 (d) ₹801

84. On an item having a marked price of ₹1600. Successive discounts of Y% and Z% were offered. As a result, the item was sold for ₹1056. Which of the options below cannot be a set of values for Y and Z?

SSC CHSL 09/08/2023 (Shift-03)

(a) Y = 22, Z = 15.5
(b) Y = 4, Z = 31.25
(c) Y = 20, Z = 17.5
(d) Y = 12, Z = 25

85. Two offers were being made to Swaroop for a watch with a marked price of Rs.1,600. Either two successive discounts of 20%, or two discounts of 30% and 10% after each other is offered. If Swaroop opted for the better plan over the other, how much more must he have saved?

SSC CHSL 02/07/2024 (Shift-04)

(a) Rs.22 (b) Rs.30
(c) Rs.16 (d) Rs.35

86. A article is sold at three successive discounts of 10%, 20% and 25%. If the selling price of the article is ₹2,592 then what is the marked price of the article?

SSC Phase X 04/08/2022 (Shift- 03)

(a) ₹5,200 (b) ₹4,800
(c) ₹4,900 (d) ₹5,000

87. A bronze article having a marked price of Rs.1,000 is sold during a festive season sale after three successive discounts of 20% and 30% and 10%. What will be the amount (in Rs.) to be paid by a customer if she buys the article during the festival season?

SSC CGL 10/09/2024 (Shift-03)

(a) Rs.508 (b) Rs.564
(c) Rs.504 (d) Rs.496

88. The marked price of an article is Rs.2,800. It is sold at three successive discounts of 15%, 8% and 5%. Find the selling price of the article (in. Rs.).

SSC CHSL TIER-II (18/11/2024)

(a) 1997.26 (b) 1923.56
(c) 2080.12 (d) 1890.20

89. A shopkeeper marked an article at ₹5,000. The shopkeeper allows successive discounts of 20%,15% and 10%. The selling price of the article is:

SSC CGL 12/09/2024 (Shift-01)

(a) ₹2,750 (b) ₹3,000
(c) ₹2,800 (d) ₹3,060

90. A cooker is marked at ₹12,500. The dealer allows successive discounts of 6%, 6% and 4% on it. What is the net selling price of the cooker?

SSC CGL 19/09/2024 (Shift-03)

(a) ₹10,603.20
(b) ₹10,306
(c) ₹12,230
(d) ₹12,320.60

91. A coffee maker with marked price Rs.4,000 is available on successive discounts of 15%, 10% and 5%. Find the selling price of the coffee maker.

SSC CHSL 06/07/2024 (Shift-01)

(a) Rs.2,900 (b) Rs.2,903
(c) Rs.2,905 (d) Rs.2,907

92. The cost price of an article is ₹214. After allowing three successive discounts of 15%, 20% and 10% on its list price, it is sold for ₹153. If it is sold at the list price, then the profit (in ₹) will be:

SSC MTS 27/10/2021 (Shift-02)

(a) 49 (b) 39
(c) 36 (d) 45

93. The selling price of an article marked for ₹10000 after giving three discounts, 20%, 10% and k% is ₹6120. What will be selling price (in ₹) of the same article if a single discount of (k+20)% is allowed?

SSC CGL 16/08/2021 (Shift-01)

(a) 6500 (b) 8500
(c) 6800 (d) 8000

94. The marked price of an article is ₹300. It is sold for ₹177.84 after giving three successive discounts of 20%, x% and 5%. What is the value of x?

SSC CHSL 16/04/2021 (Shift-02)

(a) 15 (b) 22
(c) 24 (d) 18

95. The marked price of an article is ₹20,000. The article is sold after three successive discounts for ₹10,166. The value of the second and third successive rates is 35% and 15%, respectively. What is the value of the first rate?

CRPF HCM 23/02/2023 (Shift - 01)

(a) 6% (b) 9%
(c) 8% (d) 15%

96. The marked price of an article is ₹1,000. It is sold for ₹712.89 after three successive discounts on the marked price, one of 10% and two of x% each. What is the value of x?

SSC PHASE-IX 2022

(a) 15 (b) 11
(c) 12 (d) 13

97. A tractor manufacturing company sells each tractor for ₹5,00,000. Assuming that KISAN firm buys 50 tractors from them as a part of an annual contract, the company offers a trade discount of 10% to KISAN and an additional 2% discount if the payment is made within 30 days. What will be the amount payable by KISAN within 30 days for the consignment?

SSC Phase XII 25/06/2024 (Shift-03)

(a) ₹20,051,000
(b) ₹22,050,000
(c) ₹24,050,020
(d) ₹22,080,100

98. Ramesh purchased some items from a dealer on 19 November 2019. The bill generated was for ₹5,480. He had also purchased some items on 10 November 2019 having the bill value of ₹9,800. He cleared both the bills this time and paid the total amount in cash. If the dealer gives a scheme of 2% discount on the payments done within 10 days and 5% for the payments made in cash at the time of purchase, then find the amount paid by Ramesh on 19 November 2019?

SSC CGL 10/09/2024 (Shift-01)

(a) ₹14,850 (b) ₹14,810
(c) ₹14,890 (d) ₹14,950

99. Raghav went to a shopping mall to purchase clothes. He had two coupons with him, but only one can be used on a single day. Using the first coupon, a total discount of 30% could be obtained on the total amount. Using the second coupon, he will get 80% off on the price of the costliest shirt if he buys at least 3 shirts. What is the price at which Raghav can purchase 3 shirts at a minimum price if the prices of the three shirts are ₹1,250, ₹1,540 and ₹1,375?

SSC CGL 12/12/2022 (Shift-04)

(a) ₹2,760 (b) ₹2,915.50
(c) ₹2,775 (d) ₹2,933

100. The price of a mobile is ₹20,000. On Sundays, the shopkeeper offers a cash discount of ₹1,000 on the purchase of the mobile. Further, if someone purchases it through a credit card, he gives 5% additional discount. If someone is purchasing the mobile on a Sunday through a credit card, then how much does he/she have to pay?

SSC CHSL 27/05/2022 (Shift-02)

(a) ₹18,350 (b) ₹18,900
(c) ₹18,050 (d) ₹18,500

• TYPE – VI •
MUMTAZ CONCEPT

101. A shopkeeper allows a discount of 15% on an article and still makes a profit of 20%. What does the shopkeeper pay for an article whose marked price is ₹7,200?

SSC CPO 03/10/2023 (Shift-03)

(a) ₹5,100 (b) ₹5,120
(c) ₹6,100 (d) ₹6,120

102. An article is marked at ₹550. If it is sold at a discount of 40%, then the selling price becomes 10% more than its cost price. What is the cost price (in ₹)?

SSC CGL 09/09/2024 (Shift-01)

(a) Rs.220 (b) Rs.330
(c) Rs.300 (d) Rs.200

103. A shopkeeper allows a discount of 20% on the marked price of an item and thus gains 10%. What is the ratio of the cost price to the marked price of the item?

SSC CGL 10/09/2024 (Shift-03)

(a) 8 : 11
(b) 7 : 10
(c) 9 : 13
(d) 11 : 14

104. A shopkeeper marked the price 20% more than its cost price. If he allows a discount of 30%, then find his loss percent.

SSC CGL 17/09/2024 (Shift-01)

(a) 20% (b) 16%
(c) 25% (d) 15%

105. An article marked for ₹275 is sold at 5% discount. The seller still gains 4.5%. What did he pay for it?

SSC CGL 19/09/2024 (Shift-02)

(a) ₹250 (b) ₹125
(c) ₹200 (d) ₹225

106. A shopkeeper gives a 10% discount and still earns 10% profit. The marked price of the item is how many times (correct to 2 decimal places) the cost price?

SSC CHSL 01/07/2024 (Shift-03)

(a) 1.22 (b) 1.24
(c) 1.28 (d) 1.20

107. By selling an article at 66% of its marked price, a merchant markes a profit of 10%. If he sells the article at 80% of its marked price, then the profit percentage will be.

SSC CHSL 03/07/2024 (Shift-02)

(a) 20%
(b) $33\frac{1}{3}$%
(c) 25%
(d) $33\frac{2}{3}$%

108. A 35% profit made when a discount of 35% is given on the marked price of an item. When the discount is 45%, then the profit percentage will be:

SSC CHSL 04/07/2024 (Shift-05)

(a) $17\frac{1}{13}$%
(b) $11\frac{3}{13}$%
(c) $14\frac{3}{13}$%
(d) $13\frac{3}{17}$%

109. Anu allows a 20% discount on the marked price of an article and still makes a profit of 25%. If she gains ₹44.80 on the sale of the article, then the cost price of the article is:

SSC CGL 04/06/2019 (Shift-03)

(a) ₹188.80
(b) ₹192.80
(c) ₹184.20
(d) ₹179.20

110. A shopkeeper allows a discount of 22% to his customers and still gains 36%. Find the marked price (in Rs) of an article which costs Rs 1,092 to the shopkeeper.

SSC CHSL 09/07/2024 (Shift-02)

(a) 1,792
(b) 2,024
(c) 1,872
(d) 1,904

111. Ramesh sells an article for Rs 34,440, after allowing an 18% discount on the marked price and still manages to gain 40% profit. If Ramesh sold the article at a 12% discount on the marked price, then what will be his profit, correct to two places of decimals?

SSC CHSL 09/07/2024 (Shift-03)

(a) 50.42%
(b) 48.24%
(c) 50.24%
(d) 48.42%

112. A shopkeeper sells an item at 20% discount on the marked price and earns a profit of 90%. If he sells the same item at 40% discount, then his new profit percentage will be:

SSC CHSL 09/07/2024 (Shift-04)

(a) 48.2%
(b) 45.8%
(c) 41.8%
(d) 42.5%

113. By selling an article for Rs 2,160, Prashant allows a 20% discount and earns 28% profit. If the article is sold without any discount, the profit will be:

SSC CHSL 11/07/2024 (Shift-01)

(a) 55%
(b) 60%
(c) 65%
(d) 50%

114. The cost price of a fan is Rs 4,400. A merchant wants to make a 24% profit by selling it. At the time of sale, merchant declares a discount of 12% on the marked price. Find the marked price.

SSC CHSL 11/07/2024 (Shift-03)

(a) Rs.2,600
(b) Rs.2,060
(c) Rs.6,200
(d) Rs.6,020

115. A shopkeeper offers a 10% discount on dairy products and still manages to make a 20% profit. What is the actual cost (in ₹) to the shopkeeper of a dairy product marked ₹420?

SSC CPO 29/06/2024 (Shift-03)

(a) 315
(b) 340
(c) 350
(d) 325

116. The price of a treadmill is marked at ₹1,250. A shopkeeper earns a profit of 14% after allowing a discount of 14% on the marked price. Find the cost price (to the nearest rupee) of the treadmill.

SSC CPO 03/10/2023 (Shift-03)

(a) ₹943
(b) ₹1,043
(c) ₹840
(d) ₹845

117. In a showroom, the marked prices of various items are displayed in such manner that after giving a 10% discount to the customers, the owner of the showroom earns a profit of 20%. What is the ratio of the marked price and cost price of each item?

SSC CHSL 02/08/2023 (Shift-01)

(a) 3 : 4
(b) 4 : 3
(c) 5 : 2
(d) 2 : 5

118. A retailer buys 50 pens at the marked price of 44 pens. If he sells these pen at a discount of 1% on the marked price, what is profit percentage?

SSC CHSL 04/08/2023 (Shift-02)

(a) 10%
(b) 12.5%
(c) 12%
(d) 15%

119. The marked price of a television set is ₹18,000. A shopkeeper gives a discount of 40% and makes a profit of 10%. Find the cost price of the television set.

SSC CHSL TIER II 26/06/2023

(a) ₹$7,821\frac{3}{11}$
(b) ₹$9,531\frac{5}{11}$
(c) ₹$9,818\frac{2}{11}$
(d) ₹$8,181\frac{1}{11}$

120. A shopkeeper gives 20% commission on the retail price of one article and earns 5% profit. If his commission is reduced by 10%, then what is his approximate profit percentage? (Nearest integral value)

SSC CPO 10/11/2022 (Shift-03)

(a) 18%
(b) 10%
(c) 15%
(d) 8%

121. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price to the printed price is:

SSC CHSL 24/05/2022 (Shift- 03)

(a) 38 : 55
(b) 45 : 56
(c) 55 : 38
(d) 56 : 45

122. A shopkeeper marks an article x% above the cost price and sells it by allowing 30% discount on the marked price. If there is a loss of 4.8%, then what is the value of x?

SSC CGL 21/04/2022 (Shift-02)

(a) 36%
(b) 30%
(c) 40%
(d) 60%

123. A dealer sells an article by allowing a 20% discount on its marked price and still gains 12%. If the cost price of the article is 750, then its marked price (in ₹) is:

SSC MTS 08/10/2021 (Shift-02)

(a) 1125
(b) 1150
(c) 1050
(d) 1025

124. A merchant fixes the sale price of his goods at 42% above the cost price. He sells his goods at a 15% discount marked price. His percentage of profit (rounded off to the nearest integer) is:

SSC CGL TIER - II 26/10/2023

(a) 21%
(b) 35%
(c) 27%
(d) 42%

125. The cost price and the marked price of an item are ₹720 and ₹900 respectively. When it is sold at a discount of x%, then profit is $5x/3$%. What is the value of x?

SSC CGL 17/08/2021 (Shift-03)

(a) $7\frac{4}{7}$
(b) $8\frac{4}{7}$
(c) $5\frac{5}{7}$
(d) $5\frac{4}{7}$

126. A shopkeeper marks an article at a price such that after giving a discount of x%, he gains 20%. If the cost price and the marked price of the article are ₹920 and ₹1472 respectively, then what is the value of x?

SSC CGL 24/08/2021 (Shift-03)

(a) 18
(b) 20
(c) 25
(d) 30

127. The cost price of a bat is 75% of the marked price. Calculate the gain percentage after allowing a discount of 15%?

SSC CGL 11/09/2024 (Shift-02)

(a) 25.6%
(b) 13.33%
(c) 18.16%
(d) 21.33%

128. The marked price of an article is 26% more than its cost price. If a discount of 32% is given, what will be the loss percentage?

SSC CGL 09/09/2024 (Shift-02)

(a) 18.64%
(b) 15.25%
(c) 12.26%
(d) 14.32%

129. The marked price of 55 items was equal to the cost price of 99 items. The selling price of 56 items was equal to the marked price of 35 items. Calculate the profit or loss percentage from the sale of each item?

SSC CGL 23/09/2024 (Shift-02)

(a) 15% profit
(b) 12.25% profit
(c) 12.5% profit
(d) 12.5% loss

130. If the market price of a bag is 25% above the cost price, and a discount of 18% is declared on it, then find the gain percentage?

SSC CGL 24/09/2024 (Shift-03)

(a) 1.5%
(b) 2.0%
(c) 3.0%
(d) 2.5%

131. A shopkeeper decides to raise the marked price of an article by 40%. How much percentage discount should he allow to be able to sell the article at the original marked price?

SSC CHSL 01/0˙ /2024 (Shift-01)

(a) $28\frac{4}{7}\%$
(b) $31\frac{2}{7}\%$
(c) $24\frac{3}{7}\%$
(d) $26\frac{3}{7}\%$

132. Gaurav marks his goods 50% above the cost price and offers a discount of 30% on the marked price to his customers. What is his percentage gain?

SSC CHSL 04/07/2024 (Shift-01)

(a) 2%
(b) 3%
(c) 4%
(d) 5%

133. The marked price of an article is 25% more than its cost price. If a scheme discount of 40% is given, then the loss percentage is:

SSC CHSL 04/07/2024 (Shift-03)

(a) 15%
(b) 25%
(c) 20%
(d) 30%

134. The marked price of an item is 1.4 times the cost price. In order to earn 23.2% profit, what per cent discount can a shopkeeper allow?

SSC CHSL 09/07/2024 (Shift-01)

(a) 13%
(b) 17%
(c) 15%
(d) 12%

135. The marked price of an article is ₹660. A shopkeeper allows a discount of 20% and still gets a profit of 10%. If he sells it for ₹470, his profit or loss percent, correct to two decimal places will be:

SSC CHSL 11/08/2021 (Shift-01)

(a) Profit 3.06%
(b) Loss 2.08%
(c) Profit 7.59%
(d) Loss 5.43%

• TYPE – VII •
MISCELLANEOUS QUESTIONS

136. The marked price of an article is 20 percent more than its cost price. What minimum discount percentage can be offered by the shopkeeper to sell his article so that there is no loss?

SSC CHSL 10/03/2023 (Shift-03)

(a) 16.66%
(b) 12.56%
(c) 15.33%
(d) 13.33%

137. The marked price of mustard oil is 10% more than its cost price. At what per cent less than the marked price should it be sold, to have no profit and no loss?

MTS 04/09/2023 (Shift-03)

(a) $9\frac{2}{11}\%$
(b) $9\frac{1}{11}\%$
(c) $9\frac{3}{11}\%$
(d) $9\frac{4}{11}\%$

138. An article is market at ₹450. If it is sold at a discount of 20%, then the selling price becomes 1.5 times of its cost price. What is the cost price (in ₹)?

SSC CHSL 08/08/2023 (Shift-03)

(a) 360
(b) 240
(c) 330
(d) 270

139. The marked price of an article is ₹10,927. Due to festive season, a certain percentage of discount is declared. Raju buys an article at reduced price and sells it at ₹10,927 and makes a profit of 11.5%. What was the percentage discount offered?

SSC CGL 03/12/2022 (Shift-02)

(a) 10.3%
(b) 11.3%
(c) 11.5%
(d) 10.9%

140. A shopkeeper bought a machine for ₹4600 and spent ₹500 on its repairs and transport. He marked the machine at 8% above the overall cost price. If he sold the machine for ₹4681.80 after giving x% discount, then the value of x is:

SSC CGL 18/08/2021 (Shift-03)

(a) 18
(b) 15
(c) 20
(d) 12

141. A retailer announces a discount of 30% for selling an air-conditioner marked at ₹92,000. The cost price of the air-conditioner is 70% below the marked price. He offers a further discount of 20% if the buyer presents his membership card of the retailer's store. The profit of the retailer with the membership card scheme is what percentage of the profit of the retailer without the membership card scheme?

SSC CGL 20/07/2023 (Shift-03)

(a) 62%
(b) 65%
(c) 70%
(d) 74%

142. A shopkeeper buys three varieties of pulses at ₹132, ₹160 and ₹y per kg respectively and mixes them in the ratio 9 : 2 : 1. The marked price per kg of the blended pulses is fixed at ₹238, the shopkeeper gives a discount equal to $\frac{1}{6}$ of the marked price and still earns a profit of 40%. What is the value of y?

IB ACIO GRADE - II 17/01/2024 (Shift-04)

(a) 192
(b) 200
(c) 184
(d) 196

143. Amit and Bilal buy goods for ₹1,500 and ₹2,000, respectively. Amit marks his goods up by y%, while Bilal marks his goods up by 2y% and offers a discount of y%. If both make the same profit, then find the value of y?

SSC CGL 23/09/2024 (Shift-01)

(a) 10.5%
(b) 12%
(c) 11.5%
(d) 12.5%

144. Rohini purchases a Bluetooth headphone set from a wholesale shop for Rs.1,700 and fixes its marked price at Rs.2,000. Later, she allows a discount of 40% on its sale. What is her loss or profit percentage (correct to two decimal places)

SSC CGL 25/09/2024 (Shift-01)

(a) 25.19% loss
(b) 29.41% gain
(c) 29.41% loss
(d) 25.19% gain

145. An article costs Rs.1,000 for a salesman. He fixes its marked price as Rs.1,500. He sells it to a customer at a discount of 20%. He gives a further discount of 10% for each cash payment. Find the percentage of loss or gain that the salesman makes on sale?

SSC CGL 26/09/2024 (Shift-03)

(a) gain 8%
(b) gain 10%
(c) loss 8%
(d) loss 10%

146. A shopkeeper marks up the price of the oil by 40% and used a faulty machine which measures 15% less. If the shopkeeper gives a discount of 32%, the profit/loss percentage is:

SSC CHSL 01/07/2024 (Shift-01)

(a) 15% Loss
(b) 25% Profit
(c) 18% Loss
(d) 12% Profit

147. One company is offering a 25% discount on a particular product. Anurag visited a store. He was trying to find a deal that would allow him to save at least Rs 390. How many minimum items should he purchase if each item costs Rs 340?

SSC CHSL 01/07/2024 (Shift-04)

(a) 7
(b) 4
(c) 6
(d) 5

148. A dozen pairs of gloves of Rs 180 are available at a discount of 10%. How many pairs of gloves can be bought for Rs.54?

SSC CHSL 02/07/2024 (Shift-01)

(a) 2
(b) 8
(c) 4
(d) 6

149. A shopkeeper marks an article at Rs 150 and sells it at a discount of 25%. He also gives a gift worth Rs 2.5 .If he still makes a 10% profit, then the cost price (in Rs) of the article is:

SSC CHSL 02/07/2024 (Shift-03)

(a) 100
(b) 175
(c) 112
(d) 125

150. What is the discount that Rohan should offer on the remaining Rs 8,000 of a laptop priced at Rs 48,000, given that, he has already given a 12% discount on the first Rs 28,000 and 8% discount on the next Rs 12,000 to match the discount amount of 9.5% given on the total price?

SSC CHSL 03/07/2024 (Shift-04)

(a) 402
(b) 420
(c) 240
(d) 204

151. A company sells goods at a markup of 25% above the cost price. During a sale, the company offers a 10% discount on the marked price. If the customer pays Rs 540 after the discount, then what was the original cost price of the goods?

SSC CHSL 04/07/2024 (Shift-02)

(a) Rs.460
(b) Rs.450
(c) Rs.470
(d) Rs.480

152. A shopkeeper marks up his goods 32% above the cost price and gives a discount of 21% on the marked price. Find his gain percentage on the goods.

SSC CHSL 05/07/2024 (Shift-02)

(a) 4.28%
(b) 8.42%
(c) 4.82%
(d) 8.24%

153. A retailer gets a discount of 40% on the printed price of an article. If the retailer sells it at the printed price, then his gain percentage is:

SSC CHSL 05/07/2024 (Shift-03)

(a) $66\frac{1}{3}\%$ (b) $37\frac{2}{3}\%$
(c) $66\frac{2}{3}\%$ (d) $33\frac{1}{3}\%$

154. In a showroom the price of a washing machine is ₹65,000. The customer gets cash discount of ₹2,000 and gets a scratch card promising percentage discount of 10% to 15%. Determine the difference between the least and the maximum selling price of the washing machine.

SSC CPO 10/11/2022 (Shift-01)

(a) ₹3,150 (b) ₹3,570
(c) ₹3,200 (d) ₹3,650

155. The marked price of every item being sold by a wholesaler was ₹400. The wholesaler was offering a stock-clearance sale, under which for every four items paid for, one item was being given free. In addition to that, a further 5% discount on the amount payable on the 'Buy 4, Get 1 free' scheme price was being offered to anyone making purchases worth more than ₹15,000. Rameshwar made purchases for which the amount payable, before applying the 5% discount, was ₹16,000. What was the effective discount percentage that was finally offered to Rameshwar during this transaction?

SSC Phase-XI 30/06/2023 (Shift-01)

(a) 30% (b) 25%
(c) 28.75% (d) 24%

156. A hotel is giving a discount of 12% on the booking of 2 or more rooms. Additionally, the hotel is offering a 5% discount only on payment using any card of SBI. Rakesh booked 2 rooms in the hotel for a day at the rate of ₹1,500 per room per day. While checking out, he paid the bill using SBI Silver Card. How much amount did he have to pay?

SSC CGL 05/12/2022 (Shift-01)

(a) ₹2,498 (b) ₹1,254
(c) ₹2,508 (d) ₹2,618

157. In a shop, a discount of 5 percent is provided, and if the total payable amount after discount is more than ₹2,000, then an additional discount of 10 percent is provided. Determine the final amount to be paid (in ₹) by a customer, if he buys five products each of price ₹500.

SSC CGL 07/12/2022 (Shift-01)

(a) ₹2,500 (b) ₹2,225.5
(c) ₹2,375.5 (d) ₹2,137.5

158. If Ram purchases a fan, he gets 8% discount, however, if he purchases three fans he gets 6% on the first, 10% on the second and 12% on the third. If the price paid by the Ram for three fans is Rs.6,800, then what will be the marked price of each fan?

SSC CGL 11/09/2024 (Shift-03)

(a) Rs.2,400 (b) Rs.2,500
(c) Rs.2.450 (d) Rs.2,550

159. Rakhi purchased a basket, a wallet and a belt. She got discounts of 5%, 8% and 10% on the basket, the wallet and the belt, respectively, on their respective marked prices of ₹80, ₹150 and ₹350. How much amount (in ₹) did she pay in total?

SSC CPO 04/10/2023 (Shift-01)

(a) 510 (b) 529
(c) 580 (d) 519

160. If an electricity bill is paid before the due date, one gets a reduction of 10% on the amount of the bill. By paying the bill before the due date, a person got a reduction of ₹23. The amount of his electricity bill (in ₹) ____ was:

SSC Phase XII 25/06/2024 (Shift-02)

(a) 230 (b) 250
(c) 380 (d) 520

161. Vikram allows two successive discounts of 20% and 10% on the marked price of a book, which is equal to a single discount of ₹252. Then how much profit will Vikram get on that book, if the cost price is ₹600 ?

SSC CHSL 17/03/2023 (Shift-02)

(a) ₹72 (b) ₹56
(c) ₹48 (d) ₹54

162. Neeraj sells sarees for 3,944 each, after giving two successive discounts of 15% and 20% on its marked price. If he sells a saree giving no discount on its marked price, then he earns a profit of 45%. If he sells a saree for ₹4,496, then his profit percentage will be ______.

IB ACIO GRADE II 18/01/2024 (Shift-03)

(a) 12% (b) 15%
(c) 12.4% (d) 15.6%

163. A dealer buys an article listed at 100 and get successive discounts of 10% and 20%. He spends 10% of the cost price on transportation. At what price should he sell the article to earn a profit of 15%?

SSC CHSL 03/07/2024 (Shift-03)

(a) Rs.76.07 (b) Rs.81.07
(c) Rs.89.08 (d) Rs.91.08

164. The marked price of an article is Rs. 600. A shopkeeper purchased it on two successive discounts of 10% and 20%. He spent Rs. 68 on transportation and sold the article for Rs. 600. Find his gain or loss percentage.

SSC CHSL 03/07/2024 (Shift-01)

(a) 25% Loss
(b) 15% Profit
(c) 20% Profit
(d) 18% Loss

165. The marked price of an article is 60% above its cost price and the cost price is ₹750. It is sold for ₹710.40, after giving two successive discounts of 20% and x%. If a single discount of $1.5x$% is given on the same marked price, then his loss percentage will be:

ICAR Mains 07/07/2023 (Shift-1)

(a) 3.5% (b) 2.4%
(c) 3% (d) 2.0%

166. The marked price of 85 items was equal to the cost price of 153 items. The selling price of 104 items was equal to the marked price of 65 items. Calculate the percentage profit or loss from the sale of each item.

SSC CHSL 09/08/2023 (Shift-03)

(a) 12.5% loss
(b) 12.5% profit
(c) 15% profit
(d) 12.25% profit

167. An article costs ₹4,000 to a shopkeeper, who marks its price at ₹8,400. The shopkeeper sells it to a customer at a discount of 25%. The customer gets a further discount of 15% on the discounted price if the customer redeems a coupon issued by the store previously. What is the profit percentage (to the nearest integer) earned by the shopkeeper in this transaction?

SSC CGL 13/12/2022 (Shift-01)

(a) 34% (b) 51%
(c) 42% (d) 36%

168. Radha marks her goods 25% above the cost price. She sells 35% of goods at the marked price. 40% at 15% discount and the remaining at 20% discount. What is her overall percentage gain?

SSC CGL TIER - II 11/09/2019

(a) 12.75 (b) 11.25
(c) 11.75 (d) 10

169. A grocery store is offering a discount of 10% on the purchase of ₹500 and above. 5% off on purchases above ₹250 but less than ₹500. Additional 1% discount is given for cash down payment. If a customer buys 25 packets of biscuits at the rate of ₹30 a packet, how much will he have to pay in cash?

SSC CGL 09/12/2022 (Shift-04)

(a) ₹670.25 (b) ₹668.25
(c) ₹675 (d) ₹667.05

170. The marked price of every item being sold by a wholesaler was ₹300. The wholesaler was offering a stock-clearance sale under which, for every three items paid for, one item was being given free. In addition to this, a further 10% discount on the amount payable on the 'Buy 3, Get 1 free' scheme price was being offered to anyone making purchases worth more than ₹10,000. Ramesh made purchases for which this amount payable was ₹18,000. What was the effective percentage discount that was offered to Ramesh during this transaction?

SSC CHSL 24/05/2022 (Shift- 01)

(a) 32% (b) 31.5%
(c) 32.5% (d) 32.75%

171. A discount of 20% is given for the purchase of two books by a bookseller and a discount of 25% is offered if a customer buys more than two books. A 10% discount is being offered to all the customers on purchase of one book. An

additional 5% discount will be given to students. Sohan, a student of M.Com. in college, bought a book for ₹513. What was the marked price of the book?

SSC CGL 07/12/2022 (Shift-02)

(a) ₹650 (b) ₹540
(c) ₹600 (d) ₹605

172. Ramanna purchased raw materials for a certain price to manufacture a product. However, owing to shortage of labour, 22.5% of the raw materials could not be utilised and got wasted. 80% of the cost of raw materials used was added as the cost of manufacturing. If Ramanna could sell his product at a price to earn an overall profit of 20% after offering a discount of 20%, how many times of the total cost of the raw materials purchased was the marked price of the product?

SSC CPO 27/06/2024 (Shift-01)

(a) 2.44 times (b) 42 times
(c) 2.43 times (d) 2.40 times

173. A manufacturer announces a trade discount of 30% on his products for his dealers. One of the dealers purchased 6 smart phones manufactured by the company at the rate of ₹25,000 each. What is the amount of trade discount?

SSC CGL 13/09/2024 (Shift-03)

(a) ₹50,000 (b) ₹55,000
(c) ₹1,05,000 (d) ₹45,000

174. Shopkeeper A marks up his price for an item at 25% and offers a discount of 15%. The same item is marked at 20% by another shopkeeper B and sold at a discount of 12%. Who gets a better deal in terms of % profit and by what profit percentage he sells that item?

SSC CHSL 10/07/2024 (Shift-02)

(a) B by 5.6% (b) B by 0.65%
(c) A by 0.55% (d) A by 6.25%

175. A seller offers a discount of 12% if the total sale price of different products purchased by a single customer is below ₹3,000, and discount of 15% if the total sale value of all the products exceeds ₹3,000. A shirt costing ₹900 was sold to Anand after earning a margin of 9% and also a jacket costing ₹1,900 was sold to him after a margin of 6%. How much does Anand have to pay (in ₹) for the final settlement of the bill?

SSC CPO 28/06/2024 (Shift-01)

(a) 2,953.60 (b) 3,005.40
(c) 2,645.60 (d) 2,635.60

176. On the tag price, a seller offers a 10% discount and a cashback of ₹250. He still earns 10% profit. If the cost price is ₹1,200, then the tag price (rounded off to 2 decimal places) is ₹______.

SSC CPO 28/06/2024 (Shift-02)

(a) 1447.44 (b) 1777.44
(c) 1744.44 (d) 1774.44

177. A shopkeeper gives a discount of 12% on the purchase of 10 kg of sugar. The cost price of the sugar is ₹30/kg, and the marked price is ₹38/kg. The weighing machine of the shopkeeper is faulty, and it shows weight of 1 kg when the actual weight is 900 grams. Find the percentage profit of the shop keeper (rounded off to two decimal places).

SSC CPO 28/06/2024 (Shift-02)

(a) 30.18% (b) 12.0%
(c) 22.25% (d) 23.85%

178. A dealer sells an article at ₹850 after offering a cash discount of 15% on its marked price. Without discount, he would have earned a profit of 25%. What is the cost price of the article (in ₹)

SSC Phase XII 24/06/2024 (Shift-03)

(a) 950 (b) 800
(c) 900 (d) 1000

179. To clear a stock of items, a seller gives an 8% discount on the marked price. He spends ₹x on the promotion of the discount offer. His total cost of the items is ₹2,50,000 and the marked price is 10% more than the cost price. Finally, he earns no profit or no loss. What is the value of x?

SSC Phase XII 21/06/2024 (Shift-01)

(a) 7500 (b) 3000
(c) 6000 (d) 4500

180. Kavita bought a table at 30% discount on its original price. She sold it with 48% increase on the price she bought it. What is the percentage difference between the new sale price and original price? If the original price is ₹ 8,000, then how much extra money did Kavita get as profit?

MTS 06/09/2023 (Shift-03)

(a) 5.6%; ₹280
(b) 6%; ₹360
(c) 4.5%; ₹308
(d) 3.6%; ₹288

181. A publisher supplies books to a book-seller at a 20% discount on the list price of ₹1,574.80. If the book-seller sells books at the list price and if his expenses for freight etc. are ₹45.40, determine his profit.

SSC CHSL 02/08/2023 (Shift-02)

(a) ₹285.34 (b) ₹269.56
(c) ₹273.50 (d) ₹282.22

182. The ratio of cost price (CP) and marked price (MP) of an article is 4 : 7. A discount of 20% is given on MP and the shopkeeper made a profit of ₹80. Find the CP of the article.

SSC CHSL 02/08/2023 (Shift-04)

(a) ₹190 (b) ₹170
(c) ₹200 (d) ₹180

183. A dealer gives a discount of 7% on the marked price and gives 1 article free for every 25 articles purchased and thus makes a profit of 25%. Find the percentage increase in the marked price over the cost price. (up to two decimal places)

SSC CHSL 04/08/2023 (Shift-03)

(a) 1.4% (b) 37.88%
(c) 38.87% (d) 39.78%

184. Shyam purchased a packet of 16 pens and got 4 pens free with it. He marked the price 20% more than the CP. If he did not allow any discount and sold all the 20 pens at this price, then what was his proift percentage?

SSC CHSL 08/08/2023 (Shift-02)

(a) $37\frac{1}{2}\%$ (b) 50%
(c) 36.5% (d) 48%

185. Arun brought 50 kg of rice at a discount of 15% on the marked price. For purchasing bulk quantity, he was given 5 kg of wheat (the marked price of which was 60% the marked price of rice) free of cost. Had the retailer sold both items at their marked price to his other customer, then approximately what would be the profit percentage that the shopkeeper could earn.

SSC CHSL 14/08/2023 (Shift-04)

(a) 24.7% (b) 25.2%
(c) 22.8% (d) 23.5%

186. On purchase of articles worth ₹10,000, a shopkeeper offers a flat discount of ₹500 to his customers. Further, by shopping using a credit card, he gives an additional discount of 7%. If a customer purchases article worth ₹10000 using a credit card, then how much is he/she required to pay?

SSC CGL 18/07/2023 (Shift-01)

(a) ₹8,835 (b) ₹9,000
(c) ₹8,815 (d) ₹9,300

187. The marked price of an article is 40% above its cost price. If its selling price $73\frac{1}{2}\%$ of the marked price, then the percentage profit is:

SSC CGL 26/07/2023 (Shift-03)

(a) 2.9% (b) 2.7%
(c) 2.6% (d) 2.5%

188. A store declares a discount scheme as "Buy 1 shampoo bottle and get 60% off on another shampoo of same quality, size and of the same price." What is the profit percentage of the store, if each shampoo bottle has the cost price 60% below the marked price?

SSC Phase-XI 27/06/2023 (Shift-02)

(a) 60% (b) 64%
(c) 75% (d) 54%

189. Victoria purchased items with a combined book value of $400,000. He was offered a discount of 10% on the portion of payment made in cash and a 2% surcharge on the portion of payment made through credit card. If Victoria paid a total of $378,000, how much did she pay via credit card including surcharges?

SSC Phase-XI 30/06/2023 (Shift-02)

(a) $1,53,000 (b) $1,58,100
(c) $1,63,200 (d) $1,47,900

190. A dishonest trader marks up his goods by 50% and then allows a discount of 20% on its marked price. Additionally, he uses a faulty scale which measures 900 gm. for 1 kg. shows. What will be his net profit percentage (rounded off to the nearest integer)?

SSC CGL TIER-II 06/03/2023

(a) 33% (b) 36%
(c) 27% (d) 24%

191. The marked price of a chair is 10 percent more than its cost price. If the chair is sold for ₹300 after a discount of ₹140, then what will be the loss percentage?

SSC MTS 11/05/2023 (Shift-01)

(a) 20 percent (b) 12.5 percent
(c) 25 percent (d) 17 percent

192. The marked price of a trouser and a jacket is in the ratio of 1 : 3. The shopkeeper gives 20 percent discount on the trouser. If the total discount offered on both of them together is 30 percent, then what is the discount percentage offered on the jacket?

SSC CHSL 16/03/2023 (Shift-01)

(a) 28.56% (b) 41.25%
(c) 33.33% (d) 16.66%

193. In a shop, a discount of 8% is provided. If the total payable after discount is more than ₹5,000 and additional discount of 20% is provided, then determine the final amount to be paid by customer, if he buys 12 products each of price ₹750.

SSC CPO 09/11/2022 (Shift-03)

(a) ₹6,724 (b) ₹6,824
(c) ₹6,624 (d) ₹6,524

194. The marked price of a pen is 25% more than its cost price. The pen is sold for ₹220 after a discount of ₹30. What is the profit percentage?

SSC MTS 20/07/2022 (Shift-02)

(a) 10% (b) 15%
(c) 20% (d) 17.5%

195. A shopkeeper marks up his goods by 30% and then gives a discount of 10% on the marked price. Apart from this, he uses a faulty balance which reads 1 kg for 870 g. What is his net profit percentage?

SSC CHSL 24/05/2022 (Shift-02)

(a) 38.42% (b) 34.84%
(c) 34.48% (d) 38.24%

196. A shopkeeper offers a discount of 18% on a machine and sells it for ₹48,380. If he does not offer the discount, he will get a profit of 18%. What is the cost price (in ₹) of the machine?

SSC CGL 20/04/2022 (Shift-02)

(a) 55,000
(b) 50,000
(c) 48,500
(d) 59,000

197. A trader sold an article for ₹440 after giving 12% discount on its marked price. Had he not given the discount, he would have earned a profit of 25%. What is the cost price (in ₹) of the article?

SSC PHASE-IX 2022

(a) 420 (b) 350
(c) 400 (d) 380

198. A trader gains 25% by selling an article with 20% discount on its marked price. If the cost price of the article increases by 30%, then how much discount (in %) should he offer on the same marked price to gain 15% of profit?

SSC CGL TIER - II 2022

(a) 4.87% (b) 5.08%
(c) 4.32% (d) 5.12%

199. A shopkeeper sold an article at $\frac{4}{5}$th of the marked price and suffered a loss of $3\frac{1}{3}$%. Find the profit percent, if he sold the article at the marked price. (correct to nearest integer)

SSC CGL 24/08/2021(Shift 02)

(a) 20 (b) 22
(c) 18 (d) 21

200. The marked price of an article is 25% more than its cost price. A shopkeeper sells it at a discount of x% on the marked price. If he suffers a loss of 8%, what is the value of x?

SSC CGL 05/03/2020 (Shift-02)

(a) 25.6% (b) 25.2%
(c) 26.8% (d) 26.4%

201. A shopkeeper allows 18% discount on the market price of an article and still makes a profit of 23%. If he gains ₹18.40 on the sale of the article, then what is the marked price of the article?

SSC CGL TIER - II 13/09/2019

(a) ₹140 (b) ₹125
(c) ₹120 (d) ₹146

202. A trader marks his goods at 40% above the cost price. He sells 70% of the goods at the market price and the rest, he sells remaining by allowing a 40% discount on the marked price. His percentage profit is:

SSC CGL 06/06/2019 (Shift-02)

(a) 23.4 (b) 24.2
(c) 23.2 (d) 24.4

203. The marked price of 42 items was equal to the cost price of 70 items. The selling price of 25 items was equal to the marked price of 21 items. Calculate the percentage profit or loss from the sale of each item.

SSC CHSL 01/06/2022 (Shift- 02)

(a) 42% profit
(b) 29% profit
(c) 29% loss
(d) 40% profit

204. Rohan purchased an item for which there was a 13.5% discount offered on the part of the payment made in cash and a 6.25% surcharge on the part of the payment made through a credit card. If Rohan would have paid the entire amount in cash he would have paid ₹y for the item. But he actually had to pay ₹40964 in all for the item, out of which ₹29064 was paid in cash. What is the value of y?

IB ACIO GRADE-II 17/01/2024 (Shift-01)

(a) 35700 (b) 38752
(c) 32988 (d) 38554

205. A retailer buys 220 chocolates from a wholesaler for the marked price of 198 items. He then sells each chocolate at a discount of 3.7%. What is his profit percentage?

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 7% (b) 7.2%
(c) 6% (d) 6.3%

SPEED BOOSTER HACKS

◆ Some special patterns, you should remember ◆

$3^2 = 09$
$33^2 = 1089$
$333^2 = 110889$
$3333^2 = 11108889$

$6^2 = 36$
$66^2 = 4356$
$666^2 = 443556$
$6666^2 = 44435556$

$9^2 = 81$
$99^2 = 9801$
$999^2 = 998001$
$9999^2 = 99980001$

$1^2 = 1$
$11^2 = 121$
$111^2 = 12321$
$1111^2 = 1234321$

Chapter - 3 : Discount

ANSWER KEY

1.	(a)	2.	(a)	3.	(b)	4.	(a)	5.	(b)	6.	(b)	7.	(b)	8.	(b)	9.	(b)	10.	(a)
11.	(b)	12.	(c)	13.	(a)	14.	(a)	15.	(c)	16.	(c)	17.	(d)	18.	(a)	19.	(c)	20.	(d)
21.	(b)	22.	(a)	23.	(c)	24.	(b)	25.	(d)	26.	(a)	27.	(b)	28.	(a)	29.	(c)	30.	(d)
31.	(d)	32.	(c)	33.	(d)	34.	(b)	35.	(d)	36.	(b)	37.	(c)	38.	(a)	39.	(b)	40.	(a)
41.	(b)	42.	(c)	43.	(d)	44.	(c)	45.	(b)	46.	(b)	47.	(d)	48.	(a)	49.	(a)	50.	(a)
51.	(a)	52.	(b)	53.	(c)	54.	(a)	55.	(c)	56.	(b)	57.	(b)	58.	(c)	59.	(d)	60.	(c)
61.	(a)	62.	(d)	63.	(b)	64.	(a)	65.	(d)	66.	(a)	67.	(d)	68.	(b)	69.	(b)	70.	(a)
71.	(a)	72.	(b)	73.	(a)	74.	(c)	75.	(b)	76.	(b)	77.	(a)	78.	(c)	79.	(c)	80.	(d)
81.	(a)	82.	(d)	83.	(b)	84.	(a)	85.	(c)	86.	(b)	87.	(c)	88.	(c)	89.	(d)	90.	(a)
91.	(d)	92.	(c)	93.	(a)	94.	(b)	95.	(c)	96.	(b)	97.	(b)	98.	(b)	99.	(b)	100.	(c)
101.	(a)	102.	(c)	103.	(a)	104.	(b)	105.	(a)	106.	(a)	107.	(b)	108.	(c)	109.	(d)	110.	(d)
111.	(c)	112.	(d)	113.	(b)	114.	(c)	115.	(a)	116.	(a)	117.	(b)	118.	(b)	119.	(c)	120.	(a)
121.	(b)	122.	(a)	123.	(c)	124.	(a)	125.	(b)	126.	(c)	127.	(b)	128.	(d)	129.	(c)	130.	(d)
131.	(a)	132.	(d)	133.	(b)	134.	(d)	135.	(b)	136.	(a)	137.	(b)	138.	(b)	139.	(a)	140.	(b)
141.	(b)	142.	(a)	143.	(d)	144.	(c)	145.	(a)	146.	(d)	147.	(d)	148.	(c)	149.	(a)	150.	(c)
151.	(d)	152.	(a)	153.	(c)	154.	(a)	155.	(d)	156.	(c)	157.	(d)	158.	(b)	159.	(b)	160.	(a)
161.	(c)	162.	(c)	163.	(d)	164.	(c)	165.	(b)	166.	(b)	167.	(a)	168.	(b)	169.	(b)	170.	(c)
171.	(c)	172.	(c)	173.	(d)	174.	(d)	175.	(d)	176.	(c)	177.	(d)	178.	(b)	179.	(b)	180.	(d)
181.	(b)	182.	(c)	183.	(d)	184.	(b)	185.	(a)	186.	(a)	187.	(a)	188.	(c)	189.	(a)	190.	(a)
191.	(c)	192.	(c)	193.	(c)	194.	(a)	195.	(c)	196.	(b)	197.	(c)	198.	(c)	199.	(d)	200.	(d)
201.	(c)	202.	(c)	203.	(d)	204.	(b)	205.	(a)										

SOLUTIONS

1. (a) M.P = 10,490
S.P = 9441

$$\left.\begin{matrix}\text{M.P} = 10{,}490\\ \text{S.P} = 9441\end{matrix}\right\} 1049$$

Discount % = $\frac{1049}{10490} \times 100 = 10\%$

2. (a)

$$\begin{matrix}\text{M.P} & : & \text{S.P}\\ 82500 & : & 79200\\ 825 & : & 792\end{matrix}$$

$\underbrace{825 \quad 792}_{33}$

$\therefore$ Discount% = $\frac{33 \times 100}{825} = 4\%$

3. (b) Discount % = $\frac{145 - 127.6}{145} \times 100$

$= \frac{17.4}{145} \times 100 = 12\%$

4. (a) D% = $\frac{2165 - 1710.35}{2165} \times 100$

$= \frac{454.65}{2165} \times 100 = 21\%$

5. (b) Given,

Total amount = 560 + 90 + 45 = 695

Total discount got by customer

= 10% of 695 = ₹69.50

6. (b) $27\% = \frac{27}{100} \Rightarrow \frac{73 \rightarrow \text{SP}}{100 \rightarrow \text{MP}}$

$$\begin{matrix}\text{M.P} & & \text{S.P}\\ 100 & & 73\\ \downarrow \times 156.2 & & \downarrow \times 156.2\\ 15620 & & \boxed{11{,}402.6}\\ & & \approx 11{,}400\end{matrix}$$

7. (b) M.P. = ₹900

D = 12%

$\therefore$ S.P = 900 × (100% – 12%)

$= \frac{900 \times 88}{100} = ₹792$

Note:- Here one discount is equal to 12% it means option will be divisible by 11 only option (b) satisfied.

8. (b) Given,

$\downarrow 45\% = \frac{-9}{20}$

$$\begin{matrix}\text{MP} & : & \text{SP}\\ 20 & : & 11\\ \downarrow \times 30 & & \downarrow \times 30\\ \boxed{600} & & 330\end{matrix}$$

So, MP of Shirt = ₹ 600

9. (b) Marked price of article

$= 1792 \times \frac{(100)}{(100 - 20)} = 1792 \times \frac{5}{4}$

= ₹2240

NOTE: Go through digit sum method.

10. (a)

$$\begin{matrix}\text{MP} & : & \text{SP}\\ 100 & : & 83\\ \downarrow \times 15 & & \downarrow \times 15\\ \boxed{1500} & & 1245\end{matrix}$$

Alternate Method:

$\text{SP} = \frac{(100 - D)}{100} \times \text{MP}$

$\therefore \text{MP} = \frac{1245 \times 100}{83} = ₹1500$

11. (b) Marked price of one pen = ₹ x

Selling price of one packet of 'x' pens after 15% discount is 1360.

Discount = 15% = $\frac{15}{100} = \frac{3}{20}$

$$\therefore \begin{matrix}\text{M.P} & \text{S.P}\\ 20 & 17\end{matrix}$$

M.P = $\frac{1360}{17} \times 20 = 1600$

1600 is the marked price of 'x' pens.

M.P of one pen = ₹x

$x \times x = 1600 \Rightarrow x^2 = 1600$

$\Rightarrow x = 40$

12. (c) Discount Amount = Mark price × discount%

$\therefore$ Discount Amount = $180 \times \frac{15}{100} = \frac{2700}{100}$ = Rs.27

13. (a) Discount = $2050 \times \frac{26}{100}$

$= 2050 \times \frac{13}{50} = 41 \times 13 = 533$

14. (a) Rebate of 1 item = 32 × 25% = ₹8

Number of items = $\frac{40}{8}$ = 5 items

15. (c) ATQ,

25% Discount = $\frac{1}{4}$

$\because$ 1 unit = ₹ 22400

She paid (4 – 1) = 3 unit

$= \frac{22400}{1} \times 3 = ₹\ 67200$

16. (c) CP MP SP_1 SP_2
100 : 140 : 119 : 112
A.T.Q.
7 unit → 94.85

$\therefore$ 100 unit → $\frac{94.85}{7}\times 100$ = ₹1355

17. (d) MP = 5 + 1 = 6

$\therefore$ Discount% = $\frac{1}{6}\times 100\%$ = 16.67%

18. (a) Buy 5 get 2 free

Effective discount = $\frac{2}{7}\times 100$

$= 28\frac{4}{7}\%$

19. (c) Buy 24 get 6 free

Discount % = $\frac{6}{24+6}\times 100$

$= \frac{6}{30}\times 100 = 20\%$

20. (d) Discount % = $\frac{12}{(12+24)}\times 100$

$= \frac{12}{36}\times 100 = 33\frac{1}{3}\%$

21. (b) Buy 5 and get 1
Total = 6 articles

Discount % = $\frac{1}{6}\times 1000$ = 16.67%

22. (a) In scheme (A) :

$D\% = \frac{\text{No. of free article}}{\text{Total article}}\times 100$

Net discount = $\frac{4}{7}\times 100 = 57\frac{1}{7}\%$

In scheme (B) :

Net discount = $\frac{6}{11}$ = 54.54%

$\therefore$ Scheme A has maximum discount percentage.

23. (c) Successive discount

$= 40 + 30 - \frac{40\times 30}{100}$
= 70 − 12 = 58%

Alternate Method:-

$40\% = \frac{2}{5}$, $30\% = \frac{3}{10}$

40% → I → 5 : 3
30% → II → 10 : 7
50 : 21

$\therefore$ Overall discount = $\frac{29}{50}\times 100$ = 58%

24. (b) $a + b - \frac{a.b}{100}$

$\therefore$ Discount % = $20 + 10 - \frac{20\times 10}{100}$ = 28%

25. (d) Succsessive equivalent discount

$= \left(10+15-\frac{10\times 15}{100}\right)\%$

= 25 − 1.5 = 23.5%

26. (a) Effective discount

$= 10 + 16 - \frac{10\times 16}{100}$

= 26 − 1.6 = 24.4%

27. (b) Successive discount

$= 40 + 20 - \frac{40\times 20}{100} = 60 - 8 = 52\%$

Alternate Method:-

MP SP
5 : 3
5 : 4
25 : 12

$\therefore$ Discount % = $\frac{13}{25}\times 100$ = 52%

28. (a) Let the C.P of commodity = 100 unit
ATQ,

C.P $S.P_1$ $S.P_2$

$100 \xrightarrow{+8\%} 108 \xrightarrow{-18\%} 88.56$

Discount
11.44%

Alternate Method:

$= +8\% - 18\% - \frac{8\times 18}{100}\%$

= −10% − 1.44% = −11.44%

Hence, the actual discount is 11.44%

29. (c) **First Shopkeeper**

Net discount for two successive of 25% and 15%

$= \left(25+15-\frac{25\times 15}{100}\right)\% = 36.25\%$

Second Shopkeeper

Net discount for two successive of 20% and 20%

$= \left(20+20-\frac{20\times 20}{100}\right)\% = 36\%$

Third Shopkeeper

Net discount for two successive of 30% and 10%

$= \left(30+10-\frac{30\times 10}{100}\right)\% = 37\%$

From Third Shopkeeper customer will get more profit.

Alternate Method:

When sum of given discount are same in each case, then effective discount is maximum when difference of discount is maximum.

30. (d) In scheme (i) :

Net Discount = $\left(15+15-\frac{15\times 15}{100}\right)\%$ CA
= 27.75%

In scheme (ii) :

Net Discount = $\left(25+5-\frac{25\times 5}{100}\right)\%$
= 28.75%

In scheme (iii) :

Net Discount = $\left(20+10-\frac{20\times 10}{100}\right)\%$
= 28%

In scheme (iv) :
Discount = 30%

We know, Lower the discount, maximum will be SP.

$\therefore$ Required Answer is (d)

Note:-
Product of two discount% is maximum then this offer give minimum discount.

31. (d) (i) Eff. discount = 18 − 0.8 = 17.2%
(ii) Eff. discount = 22 − 1.2 = 20.8%
(iii) Eff. discount = 24 − 1.44 = 22.56%
(iv) Eff. discount = 20%
So, max discount ⇒ lowest SP.
Hence, (iii) offer lowest price

32. (c) I. Successive discount

$= \left(15+20-\frac{15\times 20}{100}\right)\% = (35-3)\%$
= 32%

II. Successive discount

$= \left(25+10-\frac{25\times 10}{100}\right)\%$

= (35 − 2.5)% = 32.5%

III. Discount% = 33%

Selling price will be minimum under scheme III.

33. (d) (A) successive discount of 24% & 27%

$= 24 + 27 - \frac{24\times 27}{100} = 44.52\%$

(B) Buy 5 get 3 free it means get 3 free at 8 = $\frac{3}{8}\times 100\%$ = 37.5%

(C) Buy 6 and get 10 it means get (10 − 6) = 4 free on purchasing 10 = $\frac{4}{10}\times 100\%$ = 40%

$\therefore$ Minimum discount in scheme B

34. (b) Scheme: 1

$D\% = \left(25+15-\frac{25\times 15}{100}\right)\% = 36.25\%$

Scheme: 2 single discount = 20%

Scheme: 3 D% = $\frac{2}{2+3}\times 100$ = 40%

Scheme: 4 D% = $\frac{3}{3+7}\times 100$ = 30%

$\therefore$ Maximum discount is in scheme: 3.

35. (d) Scheme I : Equivalent discount

$= \left(20+10-\frac{20\times 10}{100}\right)\% = 28\%$

Scheme II: Discount of 10%
Scheme III: Discount

$= \frac{4}{(8+4)}\times 100 = 33.33\%$

Scheme IV: Discount

$= \frac{6}{(9+6)}\times 100 = 40\%$

This scheme IV has maximum discount.

36. (b) Net discount in schemes :
1. Discount = 30%
2. Two successive discounts of 15%
Net Discount

$= \left(15+15-\frac{15\times 15}{100}\right)\% = 27.75\%$

3. Buy 2 get 1 free

Net Discount = $\frac{1}{3} \times 100\% = 33.33\%$

4. Buy 5 get 3 free

Net Discount = $\frac{3}{8} \times 100\% = 37.5\%$

Thus, We can say that scheme 4 offer maximum discount to the customer.

37. (c) (i) Successive discount of 25% and 5% = $\left(25+5-\frac{25\times5}{100}\right)\%$

= 28.75%

(i) Successive discount of 20% and 10% = $\left(20+10-\frac{20\times10}{100}\right)\% = 28\%$

Difference of selling price of the article = 28.75% – 28% = 0.75%

100% → Rs.1000

$0.75\% \rightarrow \frac{1000}{100} \times 0.75 = 7.5$

∴ Difference of selling price of article = Rs.7.5

38. (a) **Way A:** M.P. → 28000

S.P. → $\frac{28000}{100} \times 76 = 21280$

Way B: Effective discount

$= 16 + 10 - \frac{160}{100} = 24.4\%$

$\Rightarrow$ S.P. = $\frac{28000}{100} \times 75.6$ = ₹21168

∴ Way B has the lowest selling price which is ₹21,168

39. (b) S.P. of watch in first condition

$3600 \times \frac{17}{20} \times \frac{17}{20} = 2601$

S.P. of watch in 2nd condition

$3600 \times \frac{9}{10} \times \frac{4}{5} = 2592$

∴ Required difference = 2601 – 2592 = 9

40. (a) In scheme (A) :

Net discount = $\frac{4}{10} \times 100\% = 40\%$

In scheme (B) :

Net discount = $\frac{5}{10} \times 100\% = 50\%$

In scheme (C) :

Net discount = $\left(18+24-\frac{18\times24}{100}\right)\%$

= 42 – 4.32 = 37.68%

Thus, Scheme B has maximum discount.

41. (b) (i) Eff. discount at successive discount of 20% = 36%

(ii) Eff. discount of 25% and 15% = 36.25%

(iii) Single discount = 40%

⇒ under scheme (iii) the selling price will be minimum.

42. (c) Offer I total discount

$= \left(25+15-\frac{15\times25}{100}\right)\% = 36.25\%$

Offer II total discount

$= \left(30+10-\frac{30\times10}{100}\right)\% = 37\%$

Offer III total discount

$= \left(35+5-\frac{35\times5}{100}\right)\% = 38.25\%$

Offer IV total discount

$= \left(20+20-\frac{20\times20}{100}\right)\% = 36\%$

So, offer no. III is best for customer.

Alternate Method:

When sum of both discount is same then offer with largest gap between both discount will be best for customer

So, from option (c) satisfied

$$\underbrace{35\% \quad : \quad 5\%}_{30\%}$$

30% Largest gap

43. (d) Net discount of 20 and 12.5%

$= \left(20+12.5-\frac{20\times12.5}{100}\right)\% = 30\%$

'Buy 7 get 3 free' is a correct discount because in this case, discount is also 30%

So, y = 7, z = 3 is true.

44. (c) Successive discount of 30% and 40% = $\left(30+40-\frac{30\times40}{100}\right)$

= (70 – 12)% = 58%

Diff. ⇒ (65% – 58%) = ₹105

7% → 105

100% → 1500

∴ Marked price = ₹1500

45. (b) Successive discount

$= \left(15+20-\frac{15\times20}{100}\right)\%$

⇒ (35 – 3)% = 32%

⇒ (32% – 25%) = ₹28

$7\% \xrightarrow{\times4} 28$

$\therefore 100\% \xrightarrow{\times4} 400$

46. (b) Successive discount of 23% and 7% = $\left(23+7-\frac{23\times7}{100}\right)\% = 28.39\%$

∴ Difference in % = (37 – 28.39)% = 8.61%

Difference = 8.61% of 2635 = Rs.226.87

47. (d) Effective discount%

$= 36 + 4 - \frac{36\times4}{100} = 40 - 1.44$

= 38.56

Difference = 40 – 38.56 = 1.44%

$\Rightarrow 1000 \times \frac{1.44}{100}$ = ₹14.40

48. (a) Given,

Discount = 27%

Equivalent discount at 20% and 10%

$= \left(x+y-\frac{xy}{100}\right) = \left(10+20-\frac{20\times10}{100}\right)$

= 28%

(28% – 27%) = 1% → ₹56

∴ 100% → ₹5600

49. (a) Equivalent discount

$= \left(x+y-\frac{xy}{100}\right)$

$= \left(26+5-\frac{26\times5}{100}\right) = 29.7\%$

Diff. = 50000 × (30% – 29.7%)

= 50000 × 0.3% = Rs. 150

50. (a) Successive discount of 60% and 70%

$= \left(60+70-\frac{60\times70}{100}\right)\%$

= (130 – 42)% = 88%

Again, Successive discount of 88% and 80%

$= \left(88+80-\frac{88\times80}{100}\right)\%$

= (168 – 70.4)% = 97.6%

∴ Single discount = 97.6%

Alternate Method:-

$60\% \downarrow = \frac{-3}{5}$, $70\% \downarrow = \frac{-7}{10}$,

$80\% \downarrow = \frac{-4}{5}$

$$\begin{array}{ccc} O & : & N \\ 5 & : & 2 \\ 10 & : & 3 \\ 5 & : & 1 \\ \hline \underbrace{250 & : & 6}_{\text{diff.}} \end{array}$$

244

∴ Required % = $\frac{244}{250} \times 100 = 97.6\%$

51. (a) $15\%\downarrow = \frac{-3}{20}$, $20\%\downarrow = \frac{-1}{5}$, $5\%\downarrow = \frac{-1}{20}$

$$\begin{array}{ccc} O & : & N \\ 20 & : & 17 \\ 5 & : & 4 \\ 20 & : & 19 \\ \hline \underbrace{500 & : & 323}_{\text{diff.}} \end{array}$$

177

Discount % = $\frac{177}{500} \times 100 = 35.4\%$

Alternate Method:

Successive discount of 15% and 20%

$= \left(15+20-\frac{15\times20}{100}\right)\% = 32\%$

Successive discount of 32% and 5%

$= \left(32+5-\frac{32\times5}{100}\right)\%$

= (37 – 1.6)% = 35.4%

52. (b) Three discount of 10% = $\frac{1}{10}$

$$\begin{array}{ccc} MP & : & SP \\ 10 & : & 9 \\ 10 & : & 9 \\ 10 & : & 9 \\ \hline \underbrace{1000 & : & 729} \end{array}$$

271

Discount % = $\frac{271\times100}{1000}$ = 27.1%

Difference = 28 − 27.1 = 0.9%

⇒ 2000 × 0.9% = 18

53. (c) 12% = $\frac{3}{25}$; 20% = $\frac{1}{5}$;

24% = $\frac{6}{25}$; 32% = $\frac{8}{25}$;

$$\begin{array}{ccc} 25 & : & 22 \\ 5 & : & 4 \\ 25 & : & 19 \\ 25 & : & 17 \\ \hline 78125 & : & 28424 \end{array}$$

49701

∴ Equivalent Discount %

= $\frac{49701}{78125}$ × 100 = 63.62%

Alternate Method:

Equivalent discount of 12% & 20%

$= \left(12+20-\frac{12\times20}{100}\right)\% = 29.6\%$

Equivalent discount of 24% & 32%

$= \left(24+32-\frac{24\times32}{100}\right)\% = 48.32\%$

Equivalent discount of 29.6% & 48.32%

$= \left(29.6+48.32-\frac{29.6\times48.32}{100}\right)\%$

= 63.62%

54. (a) We know,

20%↓ = $\frac{1}{5}$, 35% ↓ = $\frac{7}{20}$, 10% ↓ = $\frac{1}{10}$

$$\begin{array}{ccc} 5 & : & 4 \\ 20 & : & 13 \\ 10 & : & 9 \\ \hline 250 & : & 117 \end{array}$$

−133

∴ Required % = $\frac{133}{250}\times100$ = 53.2%

Alternate Method:

We can also use the formula

$$x+y+z-\frac{(xy+yz+xz)}{100}+\frac{xyz}{10000}$$

$= 20+35+10-\left(\frac{700+350+20}{100}\right)+\frac{7000}{10000}$

= 65 − 12.5 + 0.7 = 53.2%

Note:- We can find the answer by approximation method to avoid the calculation.

55. (c) **By successive Method:-**

$\left(5+10-\frac{5\times10}{100}\right)\% = 14.5\%$

Again, $\left(14.5+P-\frac{14.5\times P}{100}\right)\% = 31.6$

⇒ 1450 + 100p − 14.5p = 3160

⇒ 85.5p = 1710

⇒ p = $\frac{17100}{855}$ = 20%

Alternate Method:

Discount = ↓5% ↓10%   ↓31.6%

$\Rightarrow \frac{19}{20}\times\frac{9}{10} : \frac{68.4}{1000}$

⇒ 855 : 684

171

∴ Profit % = $\frac{171}{855}$ × 100 = 20%

Alternate Method:

$x+y+z-\frac{(xy+yz+xz)}{100}+\frac{xyz}{10000}$

= single discount

$\Rightarrow 5+10+P-\frac{(50+10P+5P)}{100}+\frac{50P}{10000} = 31.6$

⇒ 15 + P − 0.5 − 0.15P = 31.6

⇒ 14.5 + 0.855P = 31.6

∴ P = 20%

56. (b) SP of bed sheet

= 500 × $\frac{9}{10}\times\frac{19}{20}$ = 427.5

Alternate Method:

Successive discount

$= \left(10+5-\frac{10\times5}{100}\right)\%$

= (15 − 0.50)% = 14.50%

∴ SP of bed sheet = 500 × $\frac{85.5}{100}$

= 427.5

NOTE: Here one discount is equivalent to 10% so we can check the multiple of 9 in given option only option (b) satisfied.

57. (b) 20% = $\frac{1}{5}$↓, 12% = $\frac{3}{25}$↓

Selling price

= 15000 × $\frac{4}{5}\times\frac{22}{25}$ = 10560

Alternate method:-

Successive discount of 20% and 12%

$= \left(20+12-\frac{20\times12}{100}\right)\% = 29.60\%$

So, SP = 15000 × $\frac{70.40}{100}$ = 10560

Note:- Here one discount is equal to 12% it means ans will be divide

58. (c) 12%↓ = $\frac{-3}{25}$, 10%↓ = $\frac{-1}{10}$

25000 × $\frac{22}{25}\times\frac{9}{10}$ = ₹ 19,800

Hence, final price of washing machine = ₹19,800

Note:- here one discount is equivalent to 10% so we can check the multiple of 9. Only option (c) satisfied.

59. (d) 5% = $\frac{1}{20}$, 20% = $\frac{1}{5}$

Price of TV = 18500 × $\frac{4}{5}\times\frac{19}{20}$

= 185 × 76 = ₹14060

Note:- To avoid last step calculations, check the multiple of 19. only option (d) satisfied.

60. (c) 10% = $\frac{1}{10}$, 5% = $\frac{1}{20}$

ATQ,

90,000 × $\frac{9}{10}\times\frac{19}{20}$ = Rs.76,950

Alternate Method:-

Single discount = −10% − 5% + $\frac{10\times5}{100}$ = −14.5%

Now,

$$\begin{tikzcd} 100\% \arrow[r] \arrow[d, "-14.5\%"'] & 90{,}000 \arrow[d, "85.5\%"] \\ 85.5\% \arrow[r] & \boxed{76{,}950} \end{tikzcd}$$

61. (a) Total discount

$= \left(20+15-\frac{20\times15}{100}\right)\% = 32\%$

So, SP = 100 − 32 = 68%

⇒ 3000 × $\frac{68}{100}$ = ₹ 2040

Alternate Method:

20% = $\frac{1}{5}$↓, 15% = $\frac{3}{20}$↓

$$\begin{array}{ccc} \text{MP} & : & \text{SP} \\ 5 & : & 4 \\ 20 & : & 17 \\ 100 & : & 68 \\ \downarrow{\scriptstyle\times30} & & \downarrow{\scriptstyle\times30} \\ 3000 & & \boxed{2040} \end{array}$$

Note:- Here one discount is equal to 15% it means option will be divisible by 17. Only option (a) satisfied.

62. (d) Let, MP of sofa be x

Discount% = 15%, 25%

ATQ,

$x\times\frac{75}{100}\times\frac{85}{100} = 12750$

∴ x = ₹20,000

63. (b) ATQ,

Total amount

$= [1.5\times400]+\left[\frac{94.5}{100}\times1.5\times400\right]$

= 600 + 567 = ₹1167

64. (a) SP after I discount

⇒ $\frac{82}{100}$ × 26000 = 21,320

∴ Extra discount

$= \frac{21320-16000}{21320}\times100$

$= \frac{532000}{21320} = \frac{13300}{533} = 24.95\%$

Alternate Method:

Given,

Discount = 18%

$26000\times\frac{82}{100} : 16000$

533 : 240

−133

∴ Extra discount = $\frac{133}{533}$ × 100 = 24.95%

65. (d) Let, CP = 100; MP = 170
Then,
ATQ,

$$170 \times \frac{95}{100} \times \frac{80}{100} \times \frac{80}{100} = SP$$

$$\Rightarrow 170 \times \frac{19}{20} \times \frac{4}{5} \times \frac{4}{5} = SP$$

$$\Rightarrow \frac{34 \times 19 \times 4}{25} = SP \Rightarrow 103.36 = SP$$

Profit = 103.36 − 100 = 3.36

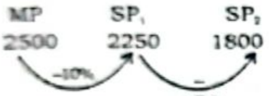
$$\therefore \text{Profit \%} = \frac{3.36}{100} \times 100 = 3.36\%$$

66. (a) Selling price $= 2000 \times \frac{17}{20} \times \frac{9}{10}$
= 1530

Alternate Method:-

$$\begin{array}{ccc} MP & & SP \\ 20 & : & 17 \\ 10 & : & 9 \\ \hline 200 & : & 153 \\ \downarrow \times 10 & & \downarrow \times 10 \\ 2000 & & \boxed{1530} \end{array}$$

67 (d)



$$\text{Required\%} = \frac{450}{2250} \times 100 = 20\%$$

SMART APPROACH:-
$$\text{Overall discount} = \frac{700}{2500} \times 100 = 28\%$$
We know successive of 10% and 20% is 28% So second discount is 20%

68. (b) $15\% = \frac{3}{20}$, $10\% = \frac{1}{10}$

$$SP = MP \times \frac{100 - D_1\%}{100} \times \frac{100 - D_2\%}{100}$$

$$= 1200 \times \frac{17}{20} \times \frac{9}{10} = 6 \times 153$$

= 918

Alternate Method:

$$\begin{array}{ccc} MP & & SP \\ 20 & : & 17 \\ 10 & : & 9 \\ \hline 200 & : & 153 \end{array}$$

$$\therefore SP = \frac{1200}{200} \times 153 = \text{Rs.}918$$

69. (b) $S.P = \frac{90}{100} \times \frac{80}{100} \times 2250$
S.P = 1620

NOTE: Here one discount is equivalent to 10% so we can check the multiple of 9 in given option only option (b) satisfied.

Alternate Method:-
Successive discount (10%, 20%) = 28%

$$SP = \frac{2250}{100\%} \times 72\% = \text{Rs.}1620$$

70. (a) $24\% = \frac{6}{25}$; $30\% = \frac{3}{10}$

$$\begin{array}{ccc} M.P & : & S.P \\ 25 & : & 19 \\ 10 & : & 7 \\ \hline 250 & & 133 \end{array}$$

133 unit → 7700.70

$$250 \text{ unit} \rightarrow \frac{7700.70}{133} \times 250$$

= 14475

Alternate Method:
Successive discount

$$= \left(24 + 30 - \frac{24 \times 30}{100}\right)\% = 46.8\%$$

SP of item = (100 − 46.8)% → 7700.70
53.2% → 7700.70

$$\therefore 100\% \rightarrow \frac{7700.70}{53.2} \times 100 = 14475$$

71. (a) Let the MP = x

$$\Rightarrow x \times \frac{9}{10} \times \frac{9}{10} = 7290$$

$\Rightarrow x = 9000$

Alternate Method:

$$10\% = \frac{-1}{10}$$

$$\begin{array}{ccc} MP & & SP \\ 10 & : & 9 \\ 10 & : & 9 \\ \hline 100 & : & 81 \\ \downarrow \times 90 & & \downarrow \times 90 \\ \boxed{9000} & & 7290 \end{array}$$

∴ MP of article = ₹9000

72. (b) ATQ,
Price at 10% discount = 700 × 90%
Additional 20% discount who pay in cash

$$\therefore \text{Net Price} = 700 \times \frac{9}{10} \times \frac{4}{5}$$

= ₹504

73. (a) Given, MP = 850
Equ. discount

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$$

$$\therefore \text{Total CP} = \frac{72}{100} \times 850 + 55$$

= 612 + 55 = 667

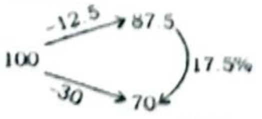
SP = 980
P = 980 − 667 = 313

$$\therefore P\% = \frac{313}{667} \times 100 = 46.93\%$$

74. (c) Overall discount

$$= \frac{150 - 105}{150} \times 100 = 45 \times \frac{2}{3} = 30\%$$

Then,



$$\Rightarrow \text{II discount} = \frac{17.5}{87.5} \times 100 = 20\%$$

Alternate Method:-

$$\text{SP after I discount} = \frac{87.5}{100} \times 150$$

= ₹131.25

∴ II discount ⇒ 131.25 − 105 = 26.25

$$\Rightarrow \text{discount\%} = \frac{26.25}{131.25} \times 100 = 20\%$$

Alternate Method:-

$$150 \times \frac{87.5}{100} \times \frac{100 - x}{100} = (105)$$

$$\Rightarrow 100 - x = \frac{105 \times 100 \times 1000}{150 \times 875} = 80\%$$

$\therefore x = 20\%$

75. (b) ATQ,

$$1600 \times \frac{83}{100} \times \frac{(100 - x)}{100} = 747$$

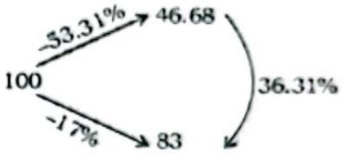
$$\Rightarrow (100 - x) = \frac{900}{16}$$

$\Rightarrow (100 - x) = 56.25$
$\Rightarrow x = 100 - 56.25 = 43.75$

Alternate Method:

$$\therefore \text{Overall discount} = \frac{1600 - 747}{1600} \times 100 = \frac{853}{16} = 53.31\%$$

Now,



$$\text{II discount} = \frac{36.31}{83} \times 100$$

= 43.75%

76. (b) We know,

$$20\% \downarrow = \frac{1}{5}, 25\% \downarrow = \frac{1}{4}$$

$$SP = ₹72000 \times \frac{4}{5} \times \frac{3}{4} = ₹43200$$

Reward Point's Value = 2850 × 0.10
= ₹285
∴ Net SP = ₹43200 − ₹285 = ₹42915

77. (a) By option (A)
Single Discount

$$= \left(20 + 20 - \frac{20 \times 20}{100}\right)\% = 36\%$$

$$\text{Price} = 920 \times \frac{36}{100}$$

= 331.2 (satisfied the question)

Alternate Method:
Given,
MP = 920, SP = 920 − 331.20

$$\begin{array}{ccc} MP & : & SP \\ 920 & : & 588.8 \\ 9200 & : & 5888 \\ \sqrt{100} & : & \sqrt{64} \\ 10 & : & 8 \end{array}$$

$$\therefore x = \frac{2}{10} \times 100 = 20\%$$

78. (c) MP = 1500
SP after giving two successive discount of
x % = 1500 − 587.40 = 912.60
912.60 = 1500

$\times \frac{(100 - x\%)}{100} \times \frac{(100 - x\%)}{100}$

$(100 - x\%)^2 = 6084$

$100 - x\% = 78 \quad \Rightarrow x\% = 22$

SP after giving single discount of

$x\% = 1500 \times \frac{78}{100} = ₹1170$

Alternate Method:

$$\begin{array}{ccc} \text{MP} & & \text{SP} \\ 1500 & : & 912.6 \end{array}$$

-587.4

MP : SP
2500 : 1521

Here, given two successive discount so we take root of number

$\sqrt{2500} : \sqrt{1521}$
$50 : 39$

$\therefore$ Discount% $= \frac{50 - 39}{50} \times 100 = 22\%$

New SP $= 1500 \times \frac{78}{100} = ₹1170$

79. (c) MP = ₹7600
Discount = 10%
7600 × 10% = 760
SP = 7600 – 760 = 6840
Now additional discount
= 6840 – 5814 = 1026

$\therefore D\% = \frac{1026}{6840} \times 100 = 15\%$

Alternate Method:

Let, addition discount be $x\%$
ATQ,

$7600 \times \frac{90}{100} \times \frac{100 - x}{100} = 5814$

$\Rightarrow 100 - x = \frac{57140}{76 \times 9} = 85$

$\Rightarrow x = 15\%$

80. (d)

	MP		SP
2D →	7200	:	4608
	900	:	576
1D →	$\sqrt{900}$	:	$\sqrt{576}$
	30	:	24

$\Rightarrow x\% = \frac{6}{30} \times 100 = 20\%$

81. (a) Price after 15% discount

$= 900 \times \frac{85}{100} = ₹765$

Next discount = 765 – 612 = ₹153

$\therefore$ Discount% $= \frac{153}{765} \times 100\% = 20\%$

Alternate Method:

Overall discount% $= \frac{900 - 612}{900} \times 100 = 32\%$

$$100 \begin{cases} \xrightarrow{-15\%} 85 \\ \xrightarrow{-32\%} 68 \end{cases} -17$$

$\therefore$ Discount% $= \frac{17}{85} \times 100 = 20\%$

82. (d)

			Same
A	20% + 20%	=	40%
B	25% + 15%	=	40%
C	30% + 10%	=	40%

$\underbrace{30\% + 10\%}_{20 \text{ (largest gap)}}$

So, C will have maximum discount

Dis.% $= \left(30 + 10 - \frac{30 \times 10}{100}\right)\% = 37\%$

= 4820 × 37% = 1783.4

NOTE:- When sum of both discount is same then offer with largest gap of both discount will be best for customer.

83. (b) Effective Discount

$= \left(10 + 10 - \frac{100}{100}\right)\% = 19\%$

$\Rightarrow$ S.P $= \frac{81}{100} \times 900 = 729$

84. (a)

$$\begin{array}{ccc} \text{MP} & & \text{CP} \\ 1600 & & 1056 \\ 100 & : & 66 \end{array}$$

-34

Total % discount = 34%
Now, check options

(a) $\left(22 + 15.5 - \frac{22 \times 15.5}{100}\right)\%$

= 37.5 – 3.410 = 34.09%

(b) $\left(4 + 31.25 - \frac{4 \times 31.25}{100}\right)\% = 34\%$

(c) $\left(20 + 17.5 - \frac{20 \times 17.5}{100}\right)\% = 34\%$

(d) $\left(12 + 25 - \frac{12 \times 25}{100}\right)\% = 34\%$

Option (a) is correct

85. (c) **Case I:** Two successive discount of 20% each

$= \left(20 + 20 - \frac{20 \times 20}{100}\right)\% = 36\%$

Case II: Two discount of 30% and 10% $= \left(30 + 10 - \frac{30 \times 10}{100}\right)\% = 37\%$

$\therefore$ Diff. = (37 – 36)% of 1600 = Rs.16
$\therefore$ Swaroop saved Rs.16.

86. (b) $10\%\downarrow = \frac{-1}{10}$, $20\%\downarrow = \frac{-1}{5}$

$25\%\downarrow = \frac{-1}{4}$

ATQ,

$\text{MP} \times \frac{9}{10} \times \frac{4}{5} \times \frac{3}{4} = 2592$

MP = ₹4800

87. (c) Let, amount paid by customer = x
ATQ,

$x = 1000 \times \frac{80}{100} \times \frac{70}{100} \times \frac{90}{100} = 504$

Alternate Method:

$20\%\downarrow = \frac{-1}{5}$, $30\%\downarrow = \frac{-3}{10}$,

$10\%\downarrow = \frac{-1}{10}$

MP	:	SP
5	:	4
10	:	7
10	:	9
500	:	252
$\downarrow\times 2$		$\downarrow\times 2$
1000		$\boxed{504}$

NOTE: Here one discount is equivalent to 10% so we can check the multiple of 9 in given option only option (c) satisfied.

Alternate Method:

Successive discount of (20%, 30%) = 44%

Successive discount of (44%, 10%) = 49.6%

$\therefore$ SP = 1000 × 50.4% = Rs.504

88. (c) SP of article $= 2800 \times \frac{17}{20} \times \frac{23}{25} \times \frac{19}{20} = 2080.12$

Alternate Method:

MP	SP
20	17
25	23
20	19
10,000	7429
$\downarrow\times 0.28$	$\downarrow\times 0.28$
2800	$\boxed{2080.12}$

NOTE:- Use unit digit method to avoid calculation.

89. (d) SP $= 5000 \times \frac{80}{100} \times \frac{85}{100} \times \frac{90}{100}$

Using digital sum method,
5 × 8 × 4 × 9 = 9
By option: ₹3060 has digit sum = '9'

Alternate Method:

MP	:	SP
5	:	4
20	:	17
10	:	9
250	:	153
$\downarrow\times 20$		$\downarrow\times 20$
5000		$\boxed{3060}$

NOTE: Here one discount is equivalent to 10% so we can check the multiple of 9 in given option only option (d) satisfied.

90. (a) Selling price of workes

$= \frac{12500 \times 94 \times 94 \times 96}{100 \times 100 \times 100} = 10603.2$

Using digital sum method,

$\frac{12500 \times 94 \times 94 \times 96}{100 \times 100 \times 100}$

$\Rightarrow 8 \times 4 \times 4 \times 6 = 5 \times 6 = 3$

option (a) 10603.20
digital sum of 10603.20 = 3

Alternate Method:

$$\begin{array}{ccc} \text{MP} & : & \text{SP} \\ 50 & : & 47 \\ 50 & : & 47 \\ 25 & : & 24 \\ \hline 62500 & : & 53016 \end{array}$$

$$\begin{tikzcd} 62500 \arrow[d, "\times\frac{1}{5}"] & 53016 \arrow[d, "\times\frac{1}{5}"] \\ 12500 & \boxed{10603.2} \end{tikzcd}$$

91. (d) $15\% \downarrow = \frac{-3}{20}$, $10\% \downarrow = \frac{-1}{10}$,

$5\% \downarrow = \frac{-1}{20}$

Selling price of coffee maker

$= 4000 \times \frac{17}{20} \times \frac{9}{10} \times \frac{19}{20} = 153 \times 19$

$= 2907$

Note:- Here one discount is equal to 10% so we can check the multiple of 9 only opt (d) satisfied.

Alternate Method:

$$\begin{array}{ccc} \text{MP} & : & \text{SP} \\ 20 & : & 17 \\ 10 & : & 9 \\ 20 & : & 19 \\ \hline 4000 & : & \boxed{2907} \end{array}$$

92. (c) Given, CP = 214

Let list price = ₹x

So, $x \times \frac{85}{100} \times \frac{80}{100} \times \frac{90}{100} = 153$

$x = ₹250$

If it is sold at list price, then profit = 250 – 214 = ₹36

93. (a) $10{,}000\left(\frac{80}{100}\right)\left(\frac{90}{100}\right)\left(\frac{100-K}{100}\right) = 6120$

$\Rightarrow 100 - K = 85$

$\Rightarrow K = 15\%$

$\Rightarrow (K + 20)\% = (15 + 20)\% = 35\%$

$\Rightarrow SP = 10000 \times \frac{65}{100} = 6500$

Alternate Method:

Discount = 20%, 10%, K%

$$\begin{array}{ccc} \text{MP} & & \text{SP} \\ 10{,}000 \times 80\% \times 90\% & : & 6120 \end{array}$$

$$\begin{tikzcd} 20 \arrow[rr, bend right, "-3"'] & : & 17 \end{tikzcd}$$

$K = \frac{3}{20} \times 100 = 15\%$

Total discount = K + 20%

= 15% + 20% = 35%

$\therefore SP = 10000 \times \frac{65}{100} = ₹6500$

94. (b) MP = ₹300

SP = ₹177.84

$$\begin{array}{ccc} \text{Discount} & \text{MP} & \text{SP} \\ 20\% & 5 & 4 \\ x\% & x & y \\ 5\% & 20 & 19 \\ \hline & 300 & 177.84 \end{array}$$

$\Rightarrow \frac{25x}{19y} = \frac{300}{177.84} \Rightarrow \frac{x}{y} = \frac{50}{39}$

$\Rightarrow D\% = \frac{11}{50} \times 100 = 22\%$

Alternate Method:

MP = 300 SP = 177.84

$300 \times \frac{19}{20} \times \frac{4}{5} \quad : \quad 177.84$

$$\begin{tikzcd} 100 \arrow[rr, bend right, "-22"'] & : & 78 \end{tikzcd}$$

$\therefore x\% = 22\%$

95. **(c)**

$$\begin{array}{cccc} & \text{MP} & & \text{SP} \\ \text{I} & 100 & : & 100 - x \\ \text{II} & 20 & : & 13 \\ \text{III} & 20 & : & 17 \\ \hline & 40000 & : & 221\,(100 - x) \end{array}$$

ATQ,

$\frac{221(100-x)}{40000} = \frac{10166}{20000}$

$\Rightarrow 221\,(100 - x) = 20332$

$\Rightarrow 221x = 22100 - 20332$

$x = \frac{1768}{221} = 8\%$

∴ The value of first rate = 8%

96. (b) ATQ,

10% discount on 1000 = 900

$\text{Discount\%} = \frac{900 - 712.89}{900} \times 100$

= 20.79

20.79 is two successive discount of 11%

Option (b) is satisfied

Alternate Method:

10% discount on 1000 = 900

Two successive discount on MP

So, we take root of number

$90000 : 71289$

$\sqrt{10000} : \sqrt{7921}$

$$\begin{tikzcd} 100 \arrow[rr, bend right, "-11"'] & : & 89 \end{tikzcd}$$

$\therefore x = 11\%$

97. (b) $10\% = \frac{1}{10}$, $2\% = \frac{1}{50}$

ATQ,

Amount payble

$= 5{,}00{,}000 \times 50 \times \frac{9}{10} \times \frac{49}{50}$

= ₹22,050,000

Note:- Here one discount is equal to 10% it means option will be divisible by 9 only option (b) satisfied.

Alternate Method:

Effective discount

$= \left(10 + 2 - \frac{2 \times 10}{100}\right)\% = 11.8\%$

Amount payable

$= 500000 \times \frac{(100 - 11.8)}{100} \times 50$

= 22,050,000

98. (b)

	10 Nov. 2019	:	19 Nov. 2019
Bill →	9800	:	5480
Discount →	2%	:	5%

Total amount paid by Ramesh on 19 Nov. 2019

$= 9800 \times \frac{98}{100} + 5480 \times \frac{95}{100}$

By digital sum method,

8 × 8 + 8 × 5 = 1 + 4 = 5

Option (b): 14810

Digital sum of 14810 = 5

99. (b) Given,

Total price = 1250 + 1540 + 1375

= 4165

I. Coupon:

$S.P = \frac{70}{100} \times 4165 = 2915.5$

II. Coupon:

S.P = 1250 + 1375 + 1540 × 20%

= 1250 + 1375 + 308 = 2933

∴ Coupon I gives minimum price.

100. (c) ATQ,

Price after cash discount

20000 – 1000 = 19000

SP after 5% discount

= 19000 × 95% = 18050

101. (a) ATQ,

$\frac{7200}{CP} = \frac{100 + P}{100 - D}$

$\frac{MP}{CP} = \frac{120}{85}$

$\therefore CP = \frac{7200 \times 85}{120} = 5100$

102. (c) $\frac{MP}{CP} = \frac{(100 + \text{Profit})\%}{(100 - \text{discount})\%}$

$\Rightarrow \frac{550}{CP} = \frac{(100 + 10)\%}{(100 - 40)\%}$

$\Rightarrow \frac{550}{CP} = \frac{11}{6}$

$\Rightarrow CP = 50 \times 6 = ₹300$

Alternate Method:

$$\begin{array}{ccccc} \text{MP} & : & \text{SP} & : & \text{CP} \\ 5_{\times 11} & : & 3_{\times 11} & & \\ & & 11_{\times 3} & : & 10_{\times 3} \\ \hline 55 & : & 33 & : & 30 \end{array}$$

$\therefore CP = \frac{550}{55} \times 30 = 300$

103. (a) $\frac{MP}{CP} = \frac{(100 + \text{Profit})\%}{(100 - \text{discount})\%}$

$= \frac{100 + 10}{100 - 20} = \frac{110}{80}$

∴ CP : MP = 8 : 11

Alternate Method:

$$\begin{array}{ccccc} \text{MP} & : & \text{SP} & : & \text{CP} \\ 5_{\times 11} & : & 4_{\times 11} & : & \\ & : & 11_{\times 4} & : & 10_{\times 4} \\ \hline 55 & : & 44 & : & 40 \end{array}$$

CP : MP

40 : 55

∴ 8 : 11

104. (b) Let, CP = 100

$$\begin{tikzcd} \text{CP} & \text{MP} & \text{SP} \\ 100 \arrow[r, bend right, "+20\%"'] & 120 \arrow[r, bend right, "-30\%"'] & 84 \end{tikzcd}$$

$\therefore \text{Loss\%} = \frac{100 - 84}{100} \times 100 = 16\%$

Alternate Method:

$$\frac{MP}{CP} = \frac{100 \pm P/L\%}{100 - D\%}$$

$$\frac{6}{5} = \frac{(100 - L\%)}{(100 - 30\%)}$$

$(100 - L\%) = 84\%$

$\therefore L\% = 16\%$

105. (a) We know,

$$\frac{CP}{MP} = \frac{100 - D\%}{100 \pm P/L\%}$$

$$\frac{CP}{275} = \frac{95}{104.5}, \ CP = Rs.250$$

Alternate Method:-

$$\begin{array}{ccccc} MP & : & SP & : & CP \\ 20_{\times 55} & : & 19_{\times 55} & : & \\ & : & 1045 & : & 1000 \\ \hline 1100 & : & 1045 & : & 1000 \end{array}$$

$$CP = \frac{275}{1100} \times 1000 = Rs.250$$

106. (a) $\frac{CP}{MP} = \frac{100 - D\%}{100 \pm P/L\%}$

$$\Rightarrow \frac{CP}{MP} = \frac{90}{110} \Rightarrow \frac{CP}{MP} = \frac{9}{11}$$

$$\Rightarrow \frac{MP}{CP} = \frac{11}{9} = 1.22$$

107. (b) $\frac{MP}{CP} = \frac{100 \pm P/L\%}{(100 - d\%)}$

$$\frac{MP}{CP} = \frac{100 + 10}{66} = \frac{110}{66} = \frac{5}{3}$$

$$SP = 5 \times \frac{4}{5} = 4$$

$$\therefore P\% = \frac{1}{3} \times 100 = 33\frac{1}{3}\%$$

108. (c) $\frac{CP}{MP} = \frac{100 - 35}{100 + 35} = \frac{65}{135} = \frac{13}{27}$

$$\text{Selling price} = 27 \times \frac{55}{100} = 14.85$$

$$\therefore \text{Profit\%} = \frac{14.85 - 13}{13} \times 100$$

$$= \frac{185}{13}\% = 14\frac{3}{13}\%$$

Alternate Method:-

$$\frac{M.P_1}{C.P_1} = \frac{M.P_2}{C.P_2} = \frac{100 + P\%}{100 - D\%}$$

$$\Rightarrow \frac{135}{65} = \frac{100 + P\%}{55}$$

$$\Rightarrow P\% = 114\frac{3}{13}\% - 100\%$$

$$\Rightarrow P\% = 14\frac{3}{13}\%$$

109. (d) $20\% = \frac{1}{5}, \ 25\% = \frac{1}{4}$

$$\begin{array}{ccccc} CP & & SP & & MP \\ & & 4 & : & 5 \\ 4 & : & 5 & & \\ \hline 16 & : & 20 & : & 25 \end{array}$$

$$4 \xrightarrow{\times 11.20} 44.80$$

1 unit → 11.20

CP (16 unit) = 11.20 × 16) = ₹179.20

SMART APPROACH:-

Let, the CP of article be 100

$$\begin{tikzcd} 25\% \arrow[r] \arrow[d, "\times 4"] & 44.8 \arrow[d, "\times 4"] \\ (CP)\ 100 & \boxed{Rs.\ 179.2} \end{tikzcd}$$

110. (d) $\frac{CP}{MP} = \frac{100 - 22}{100 + 36}$

$$\Rightarrow \frac{1092}{MP} = \frac{78}{136} \Rightarrow \frac{1092}{MP} = \frac{39}{68}$$

$$\Rightarrow MP = \frac{1092 \times 68}{39} = 1904$$

111. (c) $\frac{CP}{MP} = \frac{100 - 18}{100 + 40} = \frac{82}{140} = \frac{41}{70}$

$$\text{Selling price} = 70 \times \frac{88}{100} = 61.6$$

$$\therefore \text{Profit\%} = \frac{61.6 - 41}{41} \times 100$$

= 50.24%

Alternate Method:-

$$\frac{M.P_1}{C.P_1} = \frac{M.P_2}{C.P_2}$$

$$\frac{140}{82} = \frac{x}{88}$$

$\Rightarrow x = 150.24$

$\therefore P\% = 50.24\%$

112. (d) $\frac{CP}{MP} = \frac{100 - 20}{100 + 90} = \frac{80}{190} = \frac{8}{19}$

$$\text{Selling price} = 19 \times \frac{60}{100} = 11.4$$

$$\therefore \text{Profit\%} = \frac{11.4 - 8}{8} \times 100 = 42.5\%$$

Alternate Method:-

$$\frac{M.P_1}{C.P_1} = \frac{M.P_2}{C.P_2} \Rightarrow \frac{190}{80} = \frac{x}{60}$$

$\Rightarrow x = 142.5\%$

$\Rightarrow$ Profit = 42.5%

113. (b) $\frac{CP}{MP} = \frac{100 - 20}{100 + 28} = \frac{80}{128} = \frac{5}{8}$

When no discount is given then

$$\text{profit percentage} = \frac{8 - 5}{5} \times 100$$

= 60%

114. (c) $\frac{CP}{MP} = \frac{100 - D}{100 + P} \Rightarrow \frac{4400}{MP} = \frac{100 - 12}{100 + 24}$

$$\Rightarrow \frac{4400}{MP} = \frac{88}{124} \Rightarrow MP = 50 \times 124 =$$

6200

115. (a)

$$\begin{array}{ccc} CP & : & MP \\ (100 - D\%) & : & (100 + P\%) \\ (100 - 10) & : & (100 + 20) \\ 90 & : & 120 \\ 9 & : & 12 \\ \downarrow \times 35 & & \downarrow \times 35 \\ \boxed{315} & & 420 \end{array}$$

Alternate Method:

$$10\% = \frac{-1}{10}\circlearrowright, \ 20\% = \frac{+1}{5}\circlearrowright$$

$$\begin{array}{ccccc} C.P & : & S.P & : & M.P \\ & & 9 & : & 10 \\ 5 & : & 6 & & \\ \hline 45 & & 54 & & 60 \\ \downarrow \times 7 & & & & \downarrow \times 7 \\ \boxed{315} & & & & 420 \end{array}$$

$\therefore$ Actual cost of dairy product ₹315.

116. (a) We know,

$$\frac{MP}{CP} = \frac{100 + P}{100 - D} \Rightarrow \frac{1250}{CP} = \frac{114}{86}$$

$$CP = \frac{1250 \times 86}{114} = 942.9$$

$\therefore$ CP = ₹ 943

117. (b) ATQ,

$$\frac{CP}{MP} = \frac{(100 - 10)\%}{(100 + 20)\%} = \frac{90}{120} = \frac{3}{4}$$

MP : CP = 4 : 3

118. (b) ATQ,

CP × 50 = MP × 44

$$\frac{CP}{MP} = \frac{22}{25} \times \frac{4}{4} = \frac{88}{100} \Rightarrow SP = 99$$

$$\therefore \text{Profit} = \frac{11}{88} \times 100 = 12.5\%$$

Alternate Method:

$$\begin{array}{ccccc} CP & : & SP & : & MP \\ 44 & & 50 \times \frac{99}{100} & & 50 \\ 8 & : & 9 & & \end{array}$$

$$8 \xrightarrow{+1} 9$$

$$\therefore \text{Profit} = \frac{1}{8} \times 100 = 12.5\%$$

119. (c) $\frac{MP}{CP} = \frac{(100 \pm P/L)}{(100 - D)}$

$$\frac{18000}{CP} = \frac{110}{60}$$

$$\Rightarrow CP = \frac{18000 \times 60}{110} = \frac{108000}{11}$$

$$\Rightarrow CP = ₹9818\frac{2}{11}$$

120. (a) ATQ,

$$\frac{MP}{CP} = \frac{100 + P\%}{100 - D\%} = \frac{105}{80} = \frac{21}{16}$$

Now, commission is 10% reduced

$$\frac{MP}{CP} = \frac{18.9}{16}$$

$$\therefore P\% = \frac{2.9}{16} \times 100 = 18\%$$

SMART APPROACH:-

Let, the retail price of article be 100

$$\begin{tikzcd} \text{Retail price } 100 \arrow[r, "\text{Commission } 20\%"'] \arrow[dr, "\text{Commission } 10\%"'] & \text{SP } 80 \\ & \text{New SP } 90 \end{tikzcd}$$

$$5\% = \uparrow \frac{21}{20} \rightarrow 80$$

$$\begin{array}{ccc} CP & & \text{New SP} \\ 80 \times \frac{20}{21} & : & 90 \\ 160 & : & 189 \end{array}$$

$$160 \xrightarrow{+29} 189$$

$$D\% = \frac{29}{160} \times 100 = 18\%$$

121. (b)

$$\begin{array}{ccc} \text{C.P} & : & \text{M.P} \\ (100-\text{Discount}) & : & (100+\text{Profit}) \\ 90 & : & 112 \\ 45 & : & 56 \end{array}$$

122. (a) ATQ,

$$\frac{MP}{CP}=\frac{100\pm P/L}{100-D}$$

$$\frac{100-4.8}{100-30}=\frac{95.2}{70}\Big)25.2$$

$$\therefore\ x=\frac{25.2}{70}\times 100=36\%$$

Alternate Method:

Let, CP = 100

MP = 100 + x

$$SP=\frac{70}{10}\,(100+x)$$

$$\text{Now, } L\%=\frac{CP-SP}{CP}\times 100$$

$$4.8=\frac{100-\frac{7}{10}(100+x)}{100}\times 100$$

$48 = 1000 - 700 - 7x$

$\Rightarrow 7x = 252$

$\Rightarrow x = 36\%$

123. (c) A.T.Q,

$$\frac{CP}{MP}=\frac{100-D\%}{100+P\%}$$

$$=\frac{100-20}{100+12}=\frac{80}{112}=\frac{5}{7}$$

5 units = ₹ 750

MP → 7 units = ₹ 1050

124. (a)

$$\begin{array}{ccc} CP & & MP \\ 100 & : & 142 \end{array}$$

Discount = 15% of MP

= 15% of 142 = 21.3

SP = MP – Discount

= 142 – 21.3 = 120.7

∴ Profit% = 20.7% ≅ 21%

Alternate Method:-

$$42\%\uparrow,\ 15\%\downarrow\ =x+y+\frac{xy}{100}$$

$$42-15-\frac{42\times 15}{100}=20.7\%=21\%$$

125. (b) ATQ,

$$\frac{MP}{CP}=\frac{100\pm P/L}{100-D}$$

$$\frac{900}{720}=\frac{100+\frac{5x}{3}}{100-x}\Rightarrow\frac{5}{4}=\frac{100+\frac{5x}{3}}{100-x}$$

$$\Rightarrow 500-5x=400+\frac{20x}{3}$$

$$\Rightarrow 100=\frac{35x}{3}\ \Rightarrow x=\frac{60}{7}=8\frac{4}{7}$$

126. (c)

$$\frac{MP}{CP}=\frac{120}{100-x}$$

$$\Rightarrow\frac{120}{100-x}=\frac{1472}{920}$$

$$100-x=\frac{920\times 120}{1472}$$

$x = 25\%$

Alternate Method:

20% Profit x% Discount

$$\begin{array}{ccc} CP & : & MP \\ 920\times\frac{120}{100} & : & 1472 \\ 69 & : & 92 \end{array}$$

$$69 \xleftarrow{-23} 92$$

$$\therefore\ x\%=\frac{23}{92}\times 100=25\%$$

127. (b)

$$\begin{array}{ccc} CP & SP & MP \\ 75 & 85 & 100 \end{array}$$

$$75\xrightarrow{+10}85\xleftarrow{-15\%}100$$

$$\therefore\ \text{Profit\%}=\frac{10}{75}\times 100=13.33\%$$

128. (d) Let, CP = 100

$$\begin{array}{ccc} CP & MP & SP \\ 100 & 126 & 85.68 \end{array}$$

$$100\xrightarrow{+26\%}126\xrightarrow{-32\%}85.68$$

$$\text{Loss\%}=\frac{100-85.68}{100}\times 100$$

= 14.32%

Alternate Method:

$$\frac{MP}{CP}=\frac{100-L\%}{100-D\%}$$

$$\Rightarrow\frac{126}{100}=\frac{100-L\%}{100-32}$$

$$\Rightarrow\frac{63}{50}=\frac{100-L\%}{100-32}$$

$$\Rightarrow(100-L\%)=\frac{63\times 34}{25}$$

$\Rightarrow 100 - L\% = 85.68$

$\Rightarrow L\% = 14.32\%$

Alternate Method:

$$26\%\uparrow=\frac{+13}{50},\ 32\%\downarrow=\frac{-8}{25}$$

$$\begin{array}{ccccc} MP & : & SP & : & CP \\ 63_{\times25} & : & & : & 50_{\times25} \\ 25_{\times63} & : & 17_{\times63} & : & \\ \hline 1557 & : & 1071 & : & 1250 \end{array}$$

$$\therefore\ L\%=\frac{179}{1250}\times 100\%=\frac{358}{25}\%$$

= 14.32%

129. (c) MP × 55 = CP × 99

$$\Rightarrow\frac{MP}{CP}=\frac{9}{5}$$

SP × 56 = MP × 35

$$\Rightarrow\frac{SP}{MP}=\frac{5}{8}$$

$$\begin{array}{lccccc} & CP & & SP & & MP \\ & 5_{\times8} & & & & 9_{\times8} \\ & & & 5_{\times9} & & 8_{\times9} \\ \hline \text{Ratio}\rightarrow & 40 & : & 45 & : & 72 \end{array}$$

$$\therefore\ \text{Profit \%}=\frac{5}{40}\times 100=12.5\%$$

130. (d)

$$\begin{array}{ccccc} C.P & & M.P & & S.P \\ 100 & \xrightarrow{+25\%} & 125 & \xrightarrow{-18\%} & 102.50 \end{array}$$

$$\underbrace{100 \to 102.50}_{\text{Profit } 2.5\%}$$

Alternate Method:-

$$\frac{MP}{CP}=\frac{100\pm P/L\%}{100-D\%}$$

ATQ,

$$\frac{125}{100}=\frac{100+x}{82}$$

$\Rightarrow x = 102.5 - 100 = 2.5$

∴ Gain percentage = 2.5%

131. (a) Let M.P$_1$ of the article = 100 unit

$$\begin{array}{ccc} M.P_1 & & M.P_2 \\ 100 & \xrightarrow{+40\%} & 140 \end{array}$$

$$\underbrace{100 \quad 140}_{\text{Dis.}\rightarrow 40}$$

$$D\%=\frac{40}{140}\times 100$$

$$\therefore\ D\%=28\frac{4}{7}\%$$

132. (d) Let CP = 100

$$\begin{array}{ccc} CP & MP & SP \\ 100 & 150 & 105 \end{array}$$

$$\underbrace{100 \quad 150}_{+50\%}\underbrace{\quad 105}_{-30\%}$$

$$\therefore\ \text{Profit \%}=\frac{105-100}{100}\times 100=5\%$$

Alternate Method:-

Let, CP = 100

$$\frac{MP}{CP}=\frac{(100\pm P/L\%)}{(100-D\%)}$$

$$\frac{150}{100}=\frac{(100+P\%)}{(100-30\%)}$$

100 + P% = 105%

∴ P = 5%

133. (b)

$$\frac{MP}{CP}=\frac{100-L\%}{100-D\%}$$

$$\Rightarrow\frac{5}{4}=\frac{100-L\%}{100-40}\Rightarrow\frac{5}{4}=\frac{100-L\%}{60}$$

$\Rightarrow 75 = 100 - L\%$

$\Rightarrow L\% = 25\%$

Alternate Method:

Let CP = 100

$$\begin{array}{ccc} CP & MP & SP \\ 100 & 125 & 75 \end{array}$$

$$100\xrightarrow{+25\%}125\xrightarrow{-40\%}75$$

$$\therefore\ \text{Loss\%}=\frac{100-75}{100}\times 100=25\%$$

134. (d)

$$\frac{CP}{MP}=\frac{(100-D\%)}{(100\pm P/L\%)}$$

$$\frac{CP}{MP}=\frac{100-D}{100+23.2}$$

$$\Rightarrow\frac{CP}{1.4CP}=\frac{100-D}{100+23.2}$$

$$\Rightarrow\frac{5}{7}=\frac{100-D}{123.2}\Rightarrow 100-D=88$$

$\Rightarrow D = 12\%$

135. (b) $\frac{MP}{CP} = \frac{100 + P\%}{100 - D\%}$

$\Rightarrow \frac{660}{CP} = \frac{110}{80} \Rightarrow CP = 480$

Given, SP = 470

$\Rightarrow$ Loss% $= \frac{480 - 470}{480} \times 100$

$= \frac{1000}{480} = 2.08\%$

Alternate Method:

MP = 660 SP = 470

(100 – D)% (100 + P)%

$$\begin{array}{ccc} CP & & MP \\ 80 & : & 110 \\ \downarrow \times 6 & & \downarrow \times 6 \\ \boxed{480} & & 660 \end{array}$$

$\Rightarrow$ Loss% $= \frac{480 - 470}{480} = 2.08\%$

136. (a) $\left.\begin{array}{l} CP = 100, \; MP = 120 \\ \text{For No Loss } SP = 100 \end{array}\right\} - 20$

$\therefore$ Discount% $= \frac{20}{120} \times 100 = 16.66\%$

137. (b) Let CP = ₹100

$\therefore$ MP = ₹110

If mustard oil sold at No profit and No loss, then SP = ₹100

$\therefore$ Required % $= \frac{110 - 100}{110} \times 100\%$

$= \frac{100}{11}\% = 9\frac{1}{11}\%$

138. (b) Given,

$$\begin{array}{ccc} CP & & SP \\ 2 & : & 3 \\ \downarrow \times 120 & & \downarrow \times 120 \\ \boxed{\text{Rs. } 240} & & 80\% \text{ of } 450 = 360 \end{array}$$

139. (a) Let CP of article be 100

Given,

MP = 10927, SP = 10927

Profit = 11.5%

$CP = \frac{10927}{111.5\%} \times 100 = 9800$

$\therefore$ Discount $= \frac{10927 - 9800}{10927} \times 100$

$= 10.3\%$

SMART APPROACH:-

$$\begin{array}{ccc} MP & CP & SP \\ & 100 \xrightarrow{+11.5\%} & 111.5 \\ \text{Given} \downarrow & & \downarrow \\ 10927 & & \frac{10927}{111.5} \times 100 \end{array}$$

$\overset{MP}{111.5} : \overset{CP}{100}$ (11.5) $= \frac{11.5}{111.5} \times 100 = 10.3\%$

140. (b) CP = 4600 + 500 = ₹5100

$MP = 5100 + 5100 \times \frac{8}{100} = 5508$

SP = 4681.80

$x\% = \frac{(5508 - 4681.80)}{5508} \times 100$

$= \frac{826.2}{5508} \times 100 = 15\%$

Alternate Method:

CP = 4600 + 500 = 5100

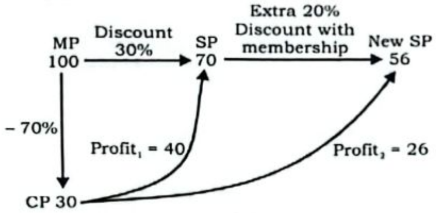
MP = 5100 × 108% D = x%

$$\begin{array}{ccc} MP & & SP \\ 5100 \times \frac{108}{100} & : & 4681.8 \\ 20 & : & 17 \end{array}$$

3

$x = \frac{3}{20} \times 100 = 15\%$

141. (b)



$\therefore$ Required% $= \frac{26}{40} \times 100 = 65\%$

142. (a) $(132 \times 9 + 160 \times 2 + Y \times 1) \times \frac{140}{100}$

$= 238 \times 12 \times \frac{5}{6}$

$\Rightarrow 1188 + 320 + y = 1700$

$\Rightarrow y = 1700 - 1508 = 192$

143. (d)

$$\begin{array}{lccc} & \text{Amit} & & \text{Bilal} \\ & CP \to 3 & : & 4 \\ \text{Let} & CP \to 300 & : & 400 \\ & \downarrow +3y & & \downarrow +8y \\ & & & 400 + 8y \\ & & & \downarrow -\left(4y + \frac{8y^2}{100}\right) \\ & SP \to 300+3y & : & 400+4y - \frac{8y^2}{100} \end{array}$$

ATQ,

Profit of Amit = Profit of Bilal

$3y = 4y - \frac{8y^2}{100}$

Both side divide by (y)

$\Rightarrow 3 = 4 - \frac{8y}{100} \Rightarrow \frac{8y}{100} = 1$

$\Rightarrow y = \frac{100}{8} = 12.5\%$

Alternate Method:

Successive change of 2y% marked up and y% discount

$\left(2y - y - \frac{2y \times y}{100}\right)\%$

$\Rightarrow \left(y - \frac{y^2}{50}\right)\%$

$$\begin{array}{lccc} & \text{Amit} & : & \text{Bilal} \\ & 1500 & : & 2000 \\ CP \to & 3 & : & 4 \\ \text{Profit} \to & 3y\% & : & 4\left(y - \frac{y^2}{50}\right)\% \end{array}$$

ATQ,

$3y\% = 4\left(y - \frac{y^2}{50}\right)\%$

$\Rightarrow 3 = 4\left(1 - \frac{y}{50}\right)$

$3 = 4 - \frac{4y}{50}$

$\Rightarrow \frac{y}{50} = \frac{1}{4} \Rightarrow y = \frac{50}{4} = 12.5\%$

144. (c) $\overset{C.P}{1700} \longrightarrow \overset{M.P}{2000} \xrightarrow{-40\%} \overset{S.P}{1200}$

$\underbrace{1700 \text{ to } 1200}_{\text{Loss } 500}$

Loss% $= \frac{500}{1700} \times 100 = 29.41\%$

Alternate Method:-

$\frac{MP}{CP} = \frac{100 - L\%}{100 - D\%}$

$\Rightarrow \frac{2000}{1700} = \frac{100 - L\%}{100 - 40}$

$\Rightarrow \frac{20}{17} = \frac{100 - L\%}{60}$

$\Rightarrow 100 - L\% = \frac{1200}{17}$

$\Rightarrow 100 - L\% = 70.58$

$\Rightarrow L\% = 29.41\%$

145. (a)

$$\begin{array}{ccccccc} CP & & MP & & SP_1 & & SP_2 \\ 1000 & : & 1500 & : & 1200 & : & 1080 \\ & & & -20\% & & -10\% & \end{array}$$

$\therefore$ gain % $= \frac{80}{1000} \times 100 = 8\%$

Alternate Method:-

Successive discount

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$

$SP = \frac{72}{100} \times 1500 = \text{Rs.}1080$

Hence, gain% $= \frac{80}{1000} \times 100 = 8\%$

146. (d) $40\% \uparrow = \frac{+2}{5}$, $15\% \downarrow = \frac{-3}{20} \to SP$,

$32\% \downarrow = \frac{-8}{25}$

$$\begin{array}{ccc} CP & : & SP \\ 5 & : & 7 \\ 17 & : & 20 \\ 25 & : & 17 \\ \hline 125 & : & 140 \end{array}$$

Diff.

15

$\therefore$ Profit percentage $= \frac{15}{125} \times 100$

= 12%

Alternate Method:

$CP \times \frac{140}{100} \times \frac{100}{85} \times \frac{68}{100} = SP$

$\Rightarrow \frac{SP}{CP} = \frac{28}{25}$

$\Rightarrow$ Gain% = $\frac{3}{25} \times 100 = 12\%$

147. (d) Cost price of product = Rs.340

Discount on each product = 340 × $\frac{25}{100}$ = Rs.85

No of products that he buy to save Rs.390 = $\frac{390}{85}$ = 4.5

So, he should purchase at least 5 items to save Rs.390.

148. (c) SP of a dozen pairs of gloves 180 × $\frac{90}{100} = 162$

$$\div 3 \left(\begin{array}{l} 12 \rightarrow 162 \\ 4 \rightarrow 54 \end{array} \right) \div 3$$

149. (a) $25\% = \frac{1}{4}$

Marked price = Rs. 150

Selling price = 150 × $\frac{3}{4}$ = 112.5

After giving A gift of worth Rs. 2.5

SP = 112.5 – 2.5 = Rs. 110

Cost price = 110 × $\frac{100}{110}$ = Rs. 100

Alternate Method:

$$\begin{array}{cccc} MP & SP & Gift & New\ SP \\ \underbrace{150 : 112.5}_{-25\%} & - 2.5 & = & 110 \end{array}$$

$\times\frac{10}{11}$

CP = 100

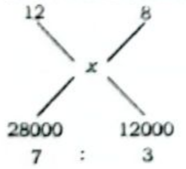
150. (c) Selling price of laptop = 48000 × $\frac{90.5}{100}$ = 43440

Total discount given on marked price = 48000 – 43440 = 4560

Discount given = 28000 × $\frac{12}{100}$ + 12000 × $\frac{8}{100}$ = 3360 + 960 = 4320

∴ Discount given on Rs.8000 = 4560 – 4320 = 240

Alternate Method:-



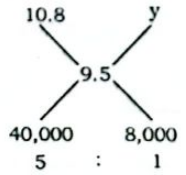
$\Rightarrow \frac{12-x}{x-8} = \frac{3}{7}$

$\Rightarrow 84 - 7x = 3x - 24$

$\Rightarrow 108 = 10x$

$\therefore x = 10.8\%$

Now,



1 unit → 1.3

5 unit → 6.5

$\Rightarrow$ y = 9.5 – 6.3 = 3%

∴ 3% of 8000 = Rs.240

151. (d) Let, original price = x

ATQ,

$x \times \frac{5}{4} \times \frac{9}{10} = 540 \Rightarrow x = 480$

152. (a)

$$\begin{array}{ccc} CP & SP & MP \\ \underbrace{100 \quad 104}_{+4.28\%}.\underbrace{28 \quad 132}_{-21\%} \end{array}$$

profit ← +4.28% –21% → Discount

∴ Profit % on goods = 4.28%

153. (c)

At the time of buy for retailer → $\underbrace{\overset{SP}{60} \qquad \overset{MP}{100}}_{\text{Discount} \rightarrow -40\%}$

At the time of selling for retailer → $\underbrace{\overset{CP}{60} \qquad \overset{SP}{100}}_{\text{Profit} \rightarrow +40\%}$

Hence, Profit % = $\frac{40}{60} \times 100$

$= 66\frac{2}{3}\%$

Alternate Method:

M.P	:	C.P	:	S.P
100	:	60	:	100

P% = $\frac{40}{60} \times 100 = 66\frac{2}{3}\%$

154. (a) ATQ,

Price of washing machine after cash discount = 65000 – 2000 = 63000

Now,

Discount = Max – Minimum

15% – 10% = 5%

∴ Diff. = 63000 × 5% = ₹3150

155. (d) Ist discount = Buy 4 get 1

$= \frac{1}{5} \times 100 = 20\%$

Second discount = 5%

∴ Effective discount

$= \left(20 + 5 - \frac{20 \times 5}{100}\right)\% = 24\%$

156. (c) Given,

12% discount on 2 or more room and additional 5% on SBI card

Eff. Discount = $\left(12 + 5 - \frac{12 \times 5}{100}\right)\%$

= (17 – 0.6)% = 16.4%

Amount paid for two rooms

= $\frac{83.6}{100}$ × 3000 = 1254 × 2 = 2508

157. (d) Given,

Discount = 5%

Total amount = 500 × 5 = 2500

price after Discount = 2500 × 95% = 2375

The amount after discount is more than 2000

So, additional 10% will be reduced from it as a discount final amount = 2375 × 90% = ₹ 2137.5

Alternate Method:

Given,

Discount = 5%, 10%

Eff. Discount = $5 + 10 - \frac{5 \times 10}{100}$

= 14.5% ⇒ Amount paid

= $\frac{85.5}{100} \times 2500$ = 2137.5

Note:- Here one discount is equal to 10% it means option will be divisible by 9 only option (d) satisfied.

158. (b) Let, the marked price of each Fan = 100x

ATQ,

$94x + 90x + 88x = 6800$

$\Rightarrow 272x = 6800 \Rightarrow x = 25$

∴ Marked price of fan = 100 × 25 = Rs.2500

159. (b)

	Bskt	Wallet	Belt
MP	80	150	350
D	5%	8%	10%
SP	76	138	315

∴ Total SP = 76 + 138 + 315 = 529

160. (a) 10% = 23

100% = 230

∴ Amount of electricity bill = ₹230

161. (c) By successive discount

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$

Single discount = 252 (given)

MP = $\frac{252}{28\%} \times 100\%$ = 900

SP = (900 – 252) = 648

CP = 600 (given)

SP = 648

∴ Profit = (648 – 600) = ₹48

162. (c)

$$\begin{array}{ccc} MP & & SP \\ \left(3944 \times \frac{100}{85} \times \frac{100}{80}\right) \times \frac{100}{145} & : & 4496 \end{array}$$

$\Rightarrow$ 4000 : 4496

∴ P% = $\frac{496}{4000} \times 100 = 12.4\%$

163. (d) Cost price of dealer

$= 100 \times \frac{9}{10} \times \frac{4}{5}$ = Rs. 72

After spending 10% of CP on transportation,

New cost price = 72 × $\frac{110}{100}$ = Rs. 79.2

Selling price = 79.2 × $\frac{115}{100}$ = Rs. 91.08

Alternate Method:-

Eff. discount = 10 + 20 – $\frac{10 \times 20}{100}$

= 30 – 2 = 28%

S.P. = 100 × $\frac{72}{100} \times \frac{11}{10} \times \frac{115}{100}$

Using digit sum = 1 × 9 × 2 × 7 = 9

From options = Rs.91.08 has digital sum = '9'

164. (c) ATQ,

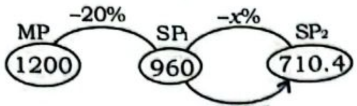
CP of article = 600 × $\frac{9}{10} \times \frac{4}{5}$ + 68 = 500

Now,

$$\text{Profit\%} = \frac{600-500}{500} \times 100\%$$

$$= \frac{100}{500} \times 100\% = 20\%$$

165. (b) $\text{MP} = 750 \times \frac{160}{100} = ₹1200$



$$\therefore x = \frac{249.6}{960} \times 100 = 26\%$$

$$\text{Now, } \frac{1200}{750} = \frac{100-\text{L}}{100-39}$$

$$\Rightarrow \frac{8}{5} \times 61 = 100 - \text{L}$$

$\Rightarrow 97.6 = 100 - \text{L}$

$\therefore \text{L} = 2.4\%$

166. (b) ATQ,

$85 \times \text{MP} = 153 \times \text{CP}$

$$\frac{\text{MP}}{\text{CP}} = \frac{9}{5}$$

ATQ, Again

$104 \times \text{SP} = \text{MP} \times 65$

$$\frac{\text{MP}}{\text{SP}} = \frac{8}{5}$$

CP : SP : MP = 40 : 45 : 72

Profit = 45 − 40 = 5

$$\therefore \text{Profit \%} = \frac{5}{40} \times 100\% = 12.5\%$$

167. (a) Given,

CP = 4000, M.P = 8400

Eff. Discount

$$= \left(25 + 15 - \frac{25 \times 15}{100}\right)\% = 36.25\%$$

$$\frac{\text{C.P}}{\text{M.P}} = \frac{100-\text{D}}{100+\text{P}}$$

$$\Rightarrow \frac{4000}{8400} = \frac{63.75}{100+\text{P}} \Rightarrow 100 + \text{P} \approx 134$$

$\therefore \text{P} \approx 34\%$

Alternate Method:

Given,

MP = 8400

CP = 4000

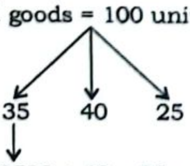
SP = 8400 × 75% × 85% = 5385

$$\text{Profit} = \frac{5385-4000}{4000} \times 100$$

∴ Profit % = 34%

168. (b) MP of 1 unit = Rs.100

Total goods = 100 unit



SP = 3500 + 40 × 85 + 25 × 80

SP = 8900 Rs

$$\text{Total CP} = \frac{100}{125} \times 10000 = 8000$$

$$\therefore \text{P\%} = \frac{900}{8000} \times 100 = 11.25\%$$

169. (b) Total purchase = 25 × 30

= ₹750

After 10% discount above 500

$$= 750 \times \frac{9}{10}$$

After cash payment additional discount of 1%

$$750 \times \frac{9}{10} \times \frac{99}{100} = ₹668.25$$

Note:- Here one discount is equal to 1% it means opt will be divisible by 11 only opt (b) satisfied.

170. (c) Buy 3 get 1 free scheme

4 : 3

10 : 9

40 : 27

13

$$\therefore \text{Discount \%} = \frac{13}{40} \times 100 = 32.5\%$$

Note: There is no need of actual value because answer will be in percentage.

171. (c) Let, the MP of book be x

Given,

Discount = 10%, 5%

$$x \times \frac{9}{10} \times \frac{19}{20} = 513$$

$\therefore x = 600$

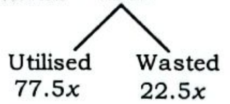
Alternate Method:

$$\text{Eff. Discount} = 10 + 5 - \frac{5 \times 10}{100}$$

$$= 14.5\% \Rightarrow \frac{513 \times 100}{85.5} = \text{M.P}$$

∴ M.P = ₹600

172. (c) Total raw material = $100x$



ATQ,

$$\text{Total CP} = 100x + 77.5x \times \frac{4}{5}$$

$= 100x + 62x = 162x$

We know,

$$\frac{\text{MP}}{\text{CP}} = \frac{100 \pm \text{P/L}}{100-\text{D}}$$

MP : CP

120 : 80

3 : 2

Given that,

2 unit = $162x$

$$3 \text{ unit} = \frac{162x}{2} \times 3 = 243x$$

$$\text{MP} = \frac{243x}{100x} = 2.43 \text{ times}$$

MP of product is 2.43 times CP of product

173. (d) Amount of trade discount

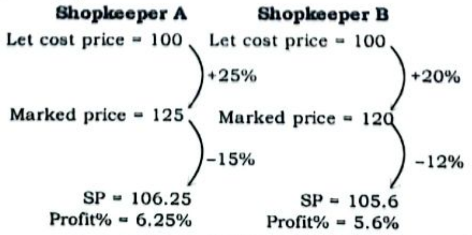
$$= 6 \times 25000 \times \frac{30}{100} = \text{Rs.}45000$$

Alternate Method:

⇒ direct check the multiple of 9 only option (d) satisfied

(6 × 30 = 9 × 20)

174. (d)



∴ A gets a better deal in term of profit and gets p% = 6.25%

175. (d) 9% Margin on 900 = 900 × 9% = 81

6% Margin on 1900 = 1900 × 6% = 114

Total margin = 114 + 81 = 195

and CP of both Shirts = 1900 + 900

= 2800

After margin its price = 2800 + 195

= 2995

SP is less than 3,000

So, he gets 12% discount then SP

$$= 2995 \times \frac{88}{100} = 2635.60$$

176. (c) Given,

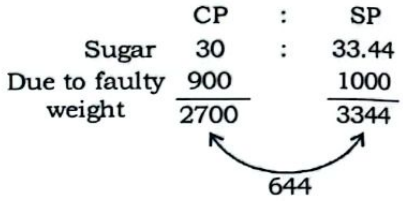
CP = 1200, D = 10%

SP at 10% profit = 1200 × 110% = 1320

$$\therefore \text{MP} = (1320 + 250) \times \frac{10}{9} = 1744.44$$

177. (d) 12% discount on 38

$$\text{So, S.P} = 38 \times \frac{88}{100} = 33.44$$



$$\therefore \text{P\%} = \frac{644}{2700} \times 100 = 23.85\%$$

178. (b) Let, M.P. of article = 100 units

Discount = 15%, profit% = 25%

$\therefore \text{SP}_1 = 85$ units

⇒ 85 units = ₹850

$$\therefore \text{SP}_2 = 100 \text{ units} = \frac{850}{85} \times 100$$

= ₹1,000

$$\therefore \text{CP} = 1000 \times \frac{4}{5} = ₹800$$

179. (b) CP : MP : SP

100 : 110 : 101.2

$$8\% \text{ discount} \Rightarrow \frac{110 \times 92}{100} = 101.2$$

$x = 101.2 - 100 = 1.2$

100 unit → ₹2,50,000

1.2 unit → ₹3,000

180. (d) CP of table to Kavita

$$= 8000 \times \frac{70}{100} = ₹\,5600$$

A.T.Q, SP of table for Kavita

$$= 5600 \times \frac{148}{100} = ₹\,8288$$

Diff. between new sale price and original price = 8288 − 8000 = ₹ 288

$$\therefore \text{Required \%} = \frac{288}{8000} \times 100\% = 3.6\%$$

Alternate Method:

Let, the original Price of table be 100

$$\begin{tikzcd}
\text{Original Price} & \text{SP}_1 & \text{SP}_2 \\
100 \arrow[r, "-30\%"'] \arrow[rr, bend right, "+3.6\%"'] & 70 \arrow[r, "+48\%"'] & 103.6
\end{tikzcd}$$

Profit % = 3.6%

∴ Profit amount = 8000 × 3.6% = 288

181. (b) CP for Bookseller

$= 1574.80 \times \frac{80}{100} = ₹1259.84$

Expense = ₹45.40

Total cost = 1259.84 + 45.40

= 1305.24

∴ Profit = 1574.80 − 1305.24

= ₹269.56

182. (c) Given,

CP   SP   MP

$40 : 56 : 70$

$40 \xrightarrow{\text{diff}} 56$, $70 \xrightarrow{-20\%} 56$

$P = 16 \text{ unit} \xrightarrow{\times 5} \text{Rs. } 80$

$40 \xrightarrow{5\times} \boxed{\text{Rs. } 200}$

183. (d) Markup → x : y

Discount → 26 × 100 : 93 × 25

Profit → 4 : 5

x : y

93×25×4 : 26×100×5

93 : 130

$93 \xrightarrow{+37} 130$

$\text{Mark up } \% = \frac{37}{93} \times 100$

= 39.78% (Approx)

184. (b) Let, CP of 1 pen = ₹ 1

Then,

Price of 16 pen = 16

After 4 pen free,

price of 20 pen = 16

At 20% mark up of 20 pen

$= 20 \times \frac{120}{100} = 24$

$\therefore \text{Profit\%} = \frac{24 - 16}{16} \times 100 = 50\%$

185. (a) Let MP of 1 kg Rice be ₹ 1.

∴ Total CP for Arun = 85% of 50

= ₹ 42.5

New total MP

= 50 × 1 + 5 × 0.6 = ₹ 53

Total profit = 53 − 42.5 = ₹ 10.5

$\therefore \text{Profit } \% = \frac{10.5}{42.5} \times 100 = 24.7\%$

186. (a) Price after discount = 10000 − 500

= ₹9500

On usage of credit card, gets additional discount 7%. Required amount to pay for the article

$= 9500 \times \frac{93}{100} = \text{Rs.}8835$

187. (a) Let, the CP of the article is 100 unit

CP   MP   SP

100   140   102.9

$100 \xrightarrow{40\%} 140 \xrightarrow{-73\frac{1}{2}\%} 102.9$

Profit = 102.9 − 100 = 2.9

$\therefore \text{Profit } \% = \frac{2.9}{100} \times 100 = 2.9\%$

188. (c) Let marked price of 1 shampoo bottle = 100

Discount = 60% off on another shampoo

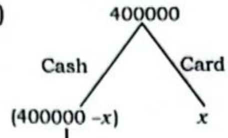
Total MP = 2 × 100 = 200

Total SP = 100 + 100 × 40% = 140

Total CP = 200 × 40% = 80

$\therefore \text{Profit} = \frac{140 - 80}{80} \times 100 = 75\%$

189. (a)



$(400000 - x)\frac{90}{100} + \frac{x \times 102}{100} = 378000$

$\frac{(400000 - x)90}{100} + \frac{102x}{100} = 378000$

12x = 1800000

x = 150000

∴ Payment via credit card including

$\text{surcharge} = \frac{150000 \times 102}{100} = 153000$

190. (a) ATQ,

C.P   M.P   C.P   S.P

100   150   90   120

$\Rightarrow \text{Profit\%} = \frac{120 - 90}{90} \times 100 \approx 33\%$

Alternate Method:

+ 50% ⟶ 2 : 3

− 20% ⟶ 5 : 4

⟶ 9 : 10

3 : 4

$\therefore \text{Profit} = \frac{1}{3} \times 100 = 33\frac{1}{3} \approx 33\%$

(approx)

191. (c) Given, SP = ₹300

$\uparrow 10\% = \frac{+1}{10}$

MP   CP

11 : 10

Now,

MP = SP + Discount

= 300 + 140 = 440

11 units → ₹440

⇒ CP = 10 units → ₹400

$\therefore \text{Loss\%} = \frac{400 - 300}{400} \times 100$

= 25%

192. (c) Trouser   Jacket

1 : 3

20%   x%

Overall 30%

$30 = \frac{20 \times 1 + 3 \times x}{(1 + 3)} \Rightarrow 30 = \frac{20 + 3x}{4}$

120 = 20 + 3x

∴ x = 33.33%

193. (c) Total Cost Price of 12 Article

= 12 × ₹750 = ₹9000

Payable Amount after discount 8%, Since the payable amount is greater than ₹5000, other discounts are also applicable.

Final payable amount

= 9000 × 92% × 80% = ₹6624

Note:- To avoid the last step calculation check the multiple of 9 in given option only option (c) satisfied.

194. (a) Given, SP = 220

MP = 220 + 30 = 250

Let, CP of the pen = 100

CP   SP   MP

100   125

$100 \xrightarrow{\times 2} \boxed{200}$, $125 \xrightarrow{\times 2} 250$

$\boxed{200} \xrightarrow{+20} 220$ 250

$\therefore \text{Profit\%} = \frac{20}{200} \times 100 = 10\%$

195. (c) CP   MP   SP

100 : 130 : 117

Now,

CP   SP

Price → 100 : 117

Quantity → 870 : 1000

87 : 117

$\text{Profit } \% = \frac{117 - 87}{87} \times 100 = 34.48\%$

196. (b) MP   SP

$100 \xrightarrow{-18\%} 82$

$100 \xrightarrow{\times 590} \boxed{59000}$, $82 \xrightarrow{\times 590} 48380$

If no discount then SP = MP

$\therefore \text{CP} = \frac{59000}{118} \times 100 = ₹50{,}000$

197. (c) Let, MP = 100%

MP   SP

$100 \xrightarrow{-12\%} 88$

$100 \xrightarrow{\times 5} \boxed{500}$, $88 \xrightarrow{\times 5} 440$

If no discount then

∴ SP = MP = 500

↑×100

↑25% = CP : SP

4 : 5

$4 \xrightarrow{\times 100} \boxed{\text{Rs. } 400}$

198. (c) $\text{Discount} = 20\%\downarrow = \frac{4 \to \text{SP}}{5 \to \text{MP}}$

$\text{Profit} = 25\%\uparrow = \frac{5 \to \text{SP}}{4 \to \text{CP}}$

CP   SP   MP

$4_{\times4} : 5_{\times4}$

$4_{\times5} : 5_{\times5}$

16 : 20 : 25

$\downarrow +30\%$

SP   MP

$16 \times \frac{13}{10} \times \frac{23}{20} : 25$

598 : 625

$625 \xrightarrow{-27} 598$

$\therefore \text{Discount } \% = \frac{27}{625} \times 100 = 4.32\%$

199. (d)

$$\begin{array}{ccc} MP & SP & CP \\ 5 & 4 & \\ & 29 & 30 \\ \hline 145 & : 116 : & 120 \end{array}$$

$$\underbrace{145 \leftarrow 120}_{+25}$$

$\therefore$ Profit % = $\frac{25}{120} \times 100 = 21\%$

200. (d) Let the cost price of an item = 100 units.
At 25% increase, marked price = 125 units, selling price at 8% loss = 92 units.

$\therefore$ Discount = $\frac{125-92}{125} \times 100$

= 26.4%

201. (c)

$$\begin{array}{ccc} CP & SP & MP \\ & 82_{\times 3} & : 100_{\times 3} \\ 100_{\times 2} & : 123_{\times 2} & \\ \hline 200 & : 246 : & 300 \end{array}$$

$$\underbrace{200 \quad 246}$$

Profit ⇒ 46 unit = 18.40

1 unit = $\frac{18.40}{46}$

MP = $300 \times \frac{18.40}{46} = 120$

202. (c) CP = 100, MP = 140, SP = 84

Lets assume quantity = 100 unit

$$\begin{array}{ccc} & 100 & \\ \swarrow & & \searrow \\ 70\% & & 30\% \end{array}$$

SP ⇒ $70 \times 140 + 30 \times 84 = 12320$

CP = $100 \times 100 = 10000$

Profit% = $\frac{12320-10000}{10000} \times 100$

= 23.2%

203. (d) 42 MP = 70 CP & 25 SP = 21 MP

Equate the MP at both place

$\frac{MP}{CP} = \frac{5_{\times 5}}{3_{\times 5}}$ $\qquad$ $\frac{SP}{MP} = \frac{21}{25}$

Now, MP : SP : CP
25 : 21 : 15

⇒ P% = $\frac{6}{15} \times 100 = 40\%$

204. (b) Let, amount paid in cash is A and amount paid by credit card is B
Then,
40964 = A + B, A = 29064
⇒ B = 40964 − 29064 = 11900

ATQ,
Amount without surcharge

= $\frac{11900}{106.25} \times 100 = 11200$

if ₹ 11200 had paid in cash then, price after discount

= $\frac{100-13.5}{100} \times 11200 = 9688$

$\therefore$ y = 29064 + 9688 = 38752

205. (a) 198MP = 220 × CP

⇒ $\frac{MP}{CP} = \frac{220}{198} = \frac{20 \times 5}{18 \times 5} = \frac{100}{90}$

So,

$$\begin{array}{ccc} MP & & CP \\ 100 & : & 90 \end{array}$$

Dis → 3.7% ↓

SP → 96.3

Profit % = $\frac{96.3-90}{90} \times 100$

= $\frac{6.3}{90} \times 100 = 7\%$

SPEED BOOSTER HACKS

♦ Calculating squares from 31 to 70 ♦

Here, Base = 50
Let N = 50 ± x
Then N² = (25 ± x)/x^2

Note:- Here, x^2 is to be written in 2 digits.

Ex. (i) $(57)^2 = (25+7)/7^2 = 3249$
(ii) $(42)^2 = (25-8)/8^2 = 1764$
(iii) $(67)^2 = (25+17)/17^2 = 42\overset{\frown +}{/}289 = 4489$
(iv) $(38)^2 = (25-12)/12^2 = 13\overset{\frown +}{/}144 = 1444$

♦ Do it Yourself ♦

(i) $(35)^2$ = ...
(ii) $(47)^2$ = ...
(iii) $(57)^2$ = ...
(iv) $(32)^2$ = ...
(v) $(63)^2$ = ...
(vi) $(69)^2$ = ...

SPEED BOOSTER HACKS

♦ Calculating squares from 71 to 100 ♦

Here, Base = 100
Let N = 100 − x
Then N² = (N − x)/x^2

Note:- Here, x^2 is to be written in 2 digit.

Ex. (i) $(94)^2 = (94-6)/6^2 = 8836$
(ii) $(97)^2 = (97-3)/3^2 = 9409$
(iii) $(89)^2 = (89-11)/11^2 = 78\overset{\frown +}{/}121 = 7921$
(iv) $(78)^2 = (78-22)/22^2 = 56\overset{\frown +}{/}484 = 6084$

♦ Do it Yourself ♦

(i) $(73)^2$ = ...
(ii) $(79)^2$ = ...
(iii) $(81)^2$ = ...
(iv) $(87)^2$ = ...
(v) $(91)^2$ = ...
(vi) $(99)^2$ = ...

04
Chapter

SIMPLE INTEREST

◆ TYPE – I ◆
BASIC QUESTIONS

1. Find the simple interest on ₹15,000 at the rate of 7% p.a. for 3 years.
SSC Phase XII 26/06/2024 (Shift-02)
(a) ₹3,000 (b) ₹3,100
(c) ₹3,150 (d) ₹3,120

2. A sum of ₹5,575 is invested at the rate of 8% simple interest per annum for 4 years. What will be the interest (in ₹) payable on maturity ?
SSC Phase XII 24/06/2024 (Shift-03)
(a) 1776 (b) 1784
(c) 1782 (d) 1788

3. Find the simple interest (in ₹) on ₹9,900 at 9% per annum in 3 years
SSC Phase XII 24/06/2024 (Shift-02)
(a) 2512 (b) 2683
(c) 2582 (d) 2673

4. A sum of ₹1,250 is lent on simple interest at a rate of $5\frac{1}{2}$% per annum for three years. Find the interest (in ₹)
SSC Phase XII 20/06/2024 (Shift-03)
(a) 210.25 (b) 200.00
(c) 215.75 (d) 206.25

5. How much simple interest will Rs.5,000 earn in 14 months at a 12% interest rate per annum?
SSC CHSL 11/07/2024 (Shift-04)
(a) ₹ 700 (b) ₹ 600
(c) ₹ 800 (d) ₹ 500

6. Find the simple interest on ₹ 8,000 at the rate of 10% per annum in 6 years.
SSC MTS 12/09/2023 (Shift- 02)
(a) ₹ 4,600 (b) ₹ 4,200
(c) ₹ 4,800 (d) ₹ 4,400

7. What sum of money (in ₹) will earn an interest of ₹ 1800 at the rate of 6% per annuun simple interest in five years?
SSC MTS 11/09/2023 (Shift-01)
(a) 5,000 (b) 18,000
(c) 6,000 (d) 8,000

8. Find the simple interest (in ₹) on ₹5,400 for 7 years at 4% per annum.
SSC MTS 06/09/2023 (Shift-01)
(a) 1,230 (b) 1,380
(c) 1,172 (d) 1,512

9. Find the simple interest on ₹1,35,000 at $6\frac{3}{4}$% per annum for 6 years.
SSC Phase XI 28/06/2023 (Shift-04)
(a) ₹54,575 (b) ₹54,675
(c) ₹54,475 (d) ₹54,875

10. How much simple interest will ₹6,000 earn in 21 months at 8% per annum?
SSC CGL 19/07/2023 (Shift-01)
(a) ₹750 (b) ₹880
(c) ₹620 (d) ₹840

11. How much simple interest will Rs.6,700 earn in 13 months at a 12% interest rate per annum?
SSC CGL 12/09/2024 (Shift-03)
(a) Rs.871 (b) Rs.889
(c) Rs.821 (d) Rs.813

12. Find the simple interest on ₹24,000 at 18% per annum for a period of 7 months
SSC Phase-XI 30/06/2023 (Shift-04)
(a) ₹ 2,525 (b) ₹ 2,520
(c) ₹ 2,530 (d) ₹ 2,535

13. The simple interest (in ₹ rounded off to the tens place) on ₹12300 from 22 May 1993 to 2 August 1993 (both days are included) at the rate of 12% per annum is:
SSC CHSL 09/08/2023 (Shift-04)
(a) 300 (b) 200
(c) 250 (d) 350

14. Manish invested a certain sum of money at 10% per annum simple interest. If he receives an interest of ₹72780 after 1 year, the sum (in ₹) he invested is:
SSC Phase XII 21/06/2024 (Shift-03)
(a) 728383 (b) 727812
(c) 727925 (d) 727800

15. Suresh invested a certain sum of money at 5% per annum simple interest. If he receives an interest of ₹69687 after 15 years, the sum (in ₹) he invested is:
SSC Phase XII 25/06/2024 (Shift-03)
(a) 92916 (b) 92880
(c) 92456 (d) 92530

16. An amount invested fetched a total simple interest of ₹4,050 at the rate of 9% per annum in 5 years. What is the amount invested (in ₹)?
SSC CHSL 09/07/2024 (Shift-03)
(a) 8,300 (b) 7,500
(c) 9,050 (d) 9,000

17. Suman paid ₹9,600 as interest on a loan she obtained 5 years ago with a simple interest rate of 16%. What was the amount of the loan she had taken?
SSC CGL 03/12/2022 (Shift-02)
(a) ₹13,250 (b) ₹12,500
(c) ₹12,000 (d) ₹11,750

18. Vinita obtained an amount of ₹23,340 as simple interest on a certain amount at 15% per annum after 8 years. What was the amount invested by Vinita?
SSC MTS 08/09/2023 (Shift-01)
(a) ₹ 17,490 (b) ₹ 20,450
(c) ₹ 19,450 (d) ₹ 18,650

19. A sum of simple interest at the rate of 5% per annum amount ₹4160 in 6 years. Find the sum.
SSC CHSL TIER-II (18/11/2024)
(a) ₹ 2800 (b) ₹ 2900
(c) ₹ 3200 (d) ₹ 3100

20. What principal would amount to ₹21,420 in 2 years at the rate of 9.5% p.a. simple interest?
SSC CGL 26/09/2024 (Shift-02)
(a) ₹ 11,273 (b) ₹ 12,000
(c) ₹ 18,000 (d) ₹ 16,000

21. A sum becomes ₹6,600 in 4 years at simple interest at a yearly interest rate of 5% per annum. What is the sum?
SSC CHSL 01/07/2024 (Shift-04)
(a) ₹ 6,000 (b) ₹ 4,400
(c) ₹ 5,500 (d) ₹ 3,300

22. What is the present worth of ₹2,400 due in 4 years at a rate of 5% simple interest per annum?
SSC CHSL 03/07/2024 (Shift-01)
(a) ₹ 2,240 (b) ₹ 2,000
(c) ₹ 2,456 (d) ₹ 2,200

23. Find the amount to be paid at the end if ₹4,500 is invested for a period of 4 years at the rate of 8% simple interest per annum.
SSC CHSL 05/07/2024 (Shift-04)
(a) 6,300 (b) 5,940
(c) 6,080 (d) 5,490

24. A sum at simple interest of 5.5% per annum amounts to ₹7,503 in 4 years. Find the sum (in ₹).
SSC MTS 14/09/2023 (Shift-03)
(a) 5,520 (b) 6,150
(c) 5,350 (d) 5,980

25. Ashima borrowed ₹75,000 from a nationalised bank on 26th March 2022 at the rate of 9% per annum simple interest. If she cleared the account on 7th June of the same year, then what amount did she pay?

SSC CHSL 02/08/2023 (Shift-03)

(a) ₹ 75,000 (b) ₹ 76,350
(c) ₹ 71,350 (d) ₹ 75,350

26. A sum of ₹12,000 amounts to ₹15,000 in 5 years at the rate of simple interest. What is the rate of interest per annum?

SSC CHSL 11/08/2023 (Shift-3)

(a) 8% (b) 7%
(c) 6% (d) 5%

27. In how many years will a sum of ₹2,500 invested at 16% simple interest become ₹4,100?

SSC CHSL TIER-II 10/01/2024

(a) 3 (b) 5
(c) 4 (d) 6

28. How many years will it take for Rs.8,400 to amount to Rs.11,928 at a simple interest rate of 7% per annum?

SSC CGL 11/09/2024 (Shift-02)

(a) 8 (b) 5
(c) 2 (d) 6

29. What is the rate of interest per annum for simple interest at which Rs.1,040 amounts to Rs.1,230 in $1\frac{1}{2}$ years?

SSC CGL 17/09/2024 (Shift-02)

(a) $11\frac{7}{39}\%$ (b) $10\frac{7}{39}\%$
(c) $12\frac{7}{39}\%$ (d) $13\frac{7}{39}\%$

30. In how many years will Rs.7,200 amount to Rs.8,928 at a simple interest rate of 8% per annum?

SSC CGL 17/09/2024 (Shift-03)
SSC CHSL 09/07/2024 (Shift-01)

(a) 4 (b) 3
(c) 2 (d) 5

31. A sum of Rs.1,456, when invested for ten years, amounts to Rs.2,366 on maturity. Find the rate of simple interest per annum that was to be paid on the sum invested.

SSC CGL 19/09/2024 (Shift-02)

(a) 5.75% (b) 6.5%
(c) 6.25% (d) 6.15%

32. How long will take for a sum ₹ 450 to accumulate ₹81 in interest at a simple interest of 4.5% per annum?

SSC CHSL 09/08/2023 (Shift-03)

(a) 4.5 years (b) 4 years
(c) 3 years (d) 3.5 years

33. A person borrowed some money on simple interest. After 4 years, he returned $\frac{9}{5}$ of the money to lender. What was the rate of interest?

SC CGL 12/09/2024 (Shift-02)

(a) 20% p.a. (b) 18% p.a.
(c) 17% p.a. (d) 19% p.a.

34. The simple interest on the sum for 12 years is three-fifth of the sum. The rate of interest per annum is:

SSC CHSL 01/07/2024 (Shift-04)

(a) 3% (b) 6%
(c) 5% (d) 4%

35. An amount of Rs.50,000 becomes Rs.72,000 in 4 years on a simple rate of interest. The rate of interest is _____ per annum.

SSC CHSL 03/07/2024 (Shift-03)

(a) 9% (b) 10%
(c) 11% (d) 12%

36. How much time (in years) will it take for an amount of Rs.4,50,000 to yield Rs.45,000 as simple interest at a 5% per annum rate of interest?

SSC CHSL 04/07/2024 (Shift-02)

(a) 5 (b) 3
(c) 2 (d) 4

37. A sum Rs.18,000 gives a simple interest of Rs.3,240 in 2 years and 3 months. The rate of interest per annum is:

SSC CHSL 05/07/2024 (Shift-01)

(a) 12% (b) 7%
(c) 8% (d) 10%

38. If the ratio of principal and simple interest for 5 years is 10 : 7, then the rate of interest per annum is:

SSC CHSL 05/07/2024 (Shift-03)

(a) 10% (b) 15%
(c) 14% (d) 11%

39. Find the simple interest (in ₹) on ₹2000 at 6.5% per annum rate of interest for the period from 14 February 2023 to 28 April 2023

SSC CGL TIER-II (18/01/2025)

(a) 24 (b) 27
(c) 26 (d) 25

40. Find the simple interest (in Rs.) on Rs.2000 at 6.5% per annum rate of interest for the period from 13 February 2023 to 27 April 2023

SSC CGL TIER-II (20/01/2025)

(a) 27 (b) 25
(c) 26 (d) 24

41. In how many years will ₹2,500 be invested at the rate of 12% per annum simple interest, which amounts to ₹4,900?

SSC CPO 28/06/2024 (Shift-01)

(a) 2 (b) 8
(c) 6 (d) 4

42. In what duration (in years) will ₹1500 amount to ₹2250 at simple interest 10% per annum?

SSC Phase XII 25/06/2024 (Shift-04)

(a) 5.5 (b) 5
(c) 3 (d) 3.5

43. A person borrowed some money on simple interest. After 3 years, he returned $\frac{4}{3}$ of the money to the lender. What was the rate of interest?

SSC CHSL TIER-II 02/11/2023

(a) $11\frac{2}{9}\%$ p.a (b) $11\frac{4}{9}\%$ p.a
(c) $11\frac{3}{9}\%$ p.a (d) $11\frac{1}{9}\%$ p.a

44. The ratio of principal and amount is 5: 6 for one year. Find the rate of simple interest per annum?

SSC MTS 04/09/2023 (Shift-03)

(a) 20% (b) 10%
(c) 11% (d) 15%

45. A sum of ₹ 5,345, when invested at a certain rate of simple interest per annum for 10 years, earns an interest of ₹ 2,672.50 on maturity. What is the rate of simple interest per annum?

SSC MTS 05/09/2023 (Shift-01)

(a) 8% (b) 6.5%
(c) 5% (d) 4.5%

46. In how many years will ₹ 2,000 invested at the rate of 11% p.a. simple interest, amount to ₹ 3,100?

SSC MTS 13/09/2023 (Shift-01)

(a) 4 (b) 5
(c) 3 (d) 2

47. How long (in years) will a sum of money invested at 6% per annum simple interest to increase its value by 40%?

SSC CHSL 02/08/2023 (Shift-01)

(a) $6\frac{2}{3}$ (b) $5\frac{2}{3}$
(c) $6\frac{1}{3}$ (d) $4\frac{1}{3}$

48. A man invested ₹25,400 on simple interest for 9 years to obtain a total amount of ₹67,790 on a certain annual rate of interest .What was the rate of interest (rounded off to 2 decimal places) to obtain the above amount ?

SSC CHSL 04/08/2023 (Shift-04)

(a) 14.58% (b) 18.54%
(c) 18.45% (d) 15.84%

49. If the simple interest on ₹2500 is more than the interest on ₹ 1500 by ₹360 in 3 years, then find the rate of interest per annum.

SSC CHSL 08/08/2023 (Shift-04)

(a) 11% (b) 9%
(c) 10% (d) 12%

50. If ₹2,000 is invested at a simple interest rate of 5% per annum and the interest is added to the principal after 10 years. then in how many years will it amount to ₹4,000 at the same rate of interest?

SSC CHSL 14/08/2023 (Shift-01)

(a) $18\frac{2}{3}$ years (b) $16\frac{1}{3}$ years
(c) $16\frac{2}{3}$ years (d) $18\frac{1}{3}$ years

51. If the simple interest at the same interest rate on ₹500 for 4 years and ₹700 for 2 years, combined together, is ₹280, then what is the rate of interest?

SSC CGL 14/07/2023 (Shift-02)

(a) $9\frac{3}{17}\%$ (b) $6\frac{5}{17}\%$
(c) $8\frac{4}{17}\%$ (d) $7\frac{3}{17}\%$

52. If the simple interest for 5 years is equal to 25% of the principal, then the interest will be equal to the principal after ______ years.

SSC CGL 18/07/2023 (Shift-01)

(a) 20 (b) 30
(c) 25 (d) 22

53. In how many years will a sum of ₹9,500 amount to ₹11,780 at the rate of 8% per annum at simple interest?

SSC CGL 18/07/2023 (Shift-03)

(a) 3 (b) 2
(c) 4 (d) 5

54. A person invests ₹9,840 at 5% per annum simple interest to obtain a total amount of ₹12,300. For how many years did he invest the sum?

SSC CGL 20/07/2023 (Shift-03)

(a) 5 years (b) 4.5 years
(c) 3.5 years (d) 3 years

55. A sum of ₹16,875 was lent out at simple interest, and at the end of 1 year 8 months, the total amount was ₹18,000. Find the rate of interest per annum.

SSC Phase XI 27/06/2023 (Shift-04)

(a) 3.7% (b) 4%
(c) 5% (d) 6.66%

56. Simple interest gained on ₹9,000 at the rate of 8% is equal to ₹2,160. Calculate the time.

SSC Phase-XI 30/06/2023 (Shift-04)

(a) 5 years (b) 4 years
(c) 2 years (d) 3 years

57. Sumit lent ₹ 5000 to Ram for 2 years and ₹ 8000 to Mayur for 3 years on simple interest at the same rate of interest and received ₹ 1700 in total from both of them as interest. What is the rate of interest per annum?

SSC MTS 19/05/2023 (Shift-03)

(a) 8% per annum
(b) 4% per annum
(c) 5% per annum
(d) 10% per annum

58. Simple interest on a sum for 5 years is equal to 20 percent of the principal. In how many years interest will be equal to the principal?

SSC CHSL 10/03/2023 (Shift-04)

(a) 12 yrs. (b) 20 yrs.
(c) 25 yrs. (d) 24 yrs.

59. The simple interest on a sum for 8 years is three-fifth of the sum. The rate of interest per annum is:

SSC CGL 23/09/2024 (Shift-02)

(a) $5\frac{1}{2}\%$ (b) $7\frac{1}{2}\%$
(c) 6% (d) 9%

60. The simple interest on a sum for 6 years is $\frac{3}{5}$ part of the sum. The rate of interest per annum is:

SSC CGL 25/09/2024 (Shift-01)

(a) 3% (b) 7%
(c) 10% (d) 5%

61. The simple interest on a sum for 8 years is $\frac{4}{5}$ of the sum. The rate of interest per annum is:

SSC CHSL 03/07/2024 (Shift-04)

(a) 20% (b) 5%
(c) 10% (d) 15%

62. Ram invested a certain sum of money at simple interest. It amounted to $\frac{5}{4}$ of itself in 3 years. What will be its rate percent per annum?

SSC CHSL 08/07/2024 (Shift-04)

(a) 7.25% (b) 8.33%
(c) 9.12% (d) 8.20%

63. A person borrowed some money on simple interest. After 4 years, he returned $\frac{9}{5}$ of the money to the lender. What was the rate of interest?

SSC CGL 21/07/2023 (Shift-02)

(a) 25% p.a. (b) 10% p.a.
(c) 15% p.a. (d) 20% p.a.

64. The simple interest on a sum of ₹ X in 5 years is $\frac{2}{5}$ of the principal. What is the annual rate of interest?

SSC Phase XI 28/06/2023 (Shift-01)

(a) 8% (b) 10%
(c) 5% (d) 12%

65. A sum of money invested at simple interest becomes $\frac{17}{10}$ of itself in 2 years and 6 months. What is the rate of interest per annum?

SSC CGL 05/12/2022 (Shift-03)

(a) 22 % (b) 16 %
(c) 28 % (d) 34 %

66. The simple interest earned on a sum is $\frac{1}{25}$ of the sum, where the number of years of investment is equal to the rate percentage. For how many years was the sum invested?

SSC MTS 12/10/2021 (Shift-02)

(a) 5 (b) 2
(c) 4 (d) 3

67. If the ratio of the principal and the simple interest for 5 years is 10 : 7, then the rate of interest per annum is:

SSC MTS 08/09/2023 (Shift-03)

(a) 16% (b) 14%
(c) 18% (d) 12%

68. A sum of ₹ 10,500 amounts to ₹ 13,825 in $3\frac{4}{5}$ years at a certain rate percent per annum simple interest. What will be the simple interest on the same sum for 5 years at double the earlier rate?

SSC CGL TIER-II 13/09/2019

(a) ₹ 8,470 (b) ₹ 8,750
(c) ₹ 8,670 (d) ₹ 8,560

69. In how much time (in years, rounded off to 2 decimal places) will Rs.10,800 amount to Rs.24,800 if invested at simple interest at the rate of 15.5% per annum?

SSC CGL 24/09/2024 (Shift-01)

(a) 7.72 (b) 8.36
(c) 9.54 (d) 6.89

70. If Rs.1,875 becomes Rs.2,625 in 4 years, what will Rs.24,000 become at the end of 9 years at the same rate of interest, under simple interest?

SSC CGL 26/09/2024 (Shift-01)

(a) Rs.45,600 (b) Rs.21,600
(c) Rs.34,800 (d) Rs.43,200

71. If a sum of Rs.3,260 on simple interest amounts to Rs.5,420 in 6 years, then what will this sum amount to in 4 years at the same rate of interest?

SSC CHSL 09/07/2024 (Shift-02)

(a) Rs.4,700 (b) Rs.3,700
(c) Rs.3,900 (d) Rs.4,500

72. If an amount of ₹80 becomes ₹96 in 2 years in a bank account which gives simple annual interest, then an amount of ₹62,000 will become ________ after 5 years.

SSC CPO 03/10/2023 (Shift-02)

(a) ₹93,000 (b) ₹84,600
(c) ₹82,400 (d) ₹88,200

73. A person borrowed ₹1760 at 6% per annum and ₹2240 at 9% per annum at simple interest for the same period. He had to pay ₹1536 in all as interest. Find the time (in years).

SSC CPO 27/06/2024 (Shift-01)

(a) 3 (b) 4
(c) 5 (d) 2

74. What will be the total due amount on ₹ 25,000 in 2 years if the interest rates are 4% and 5% respectively?

SSC CHSL 04/08/2023 (Shift-01)

(a) ₹ 26,250 (b) ₹ 28,250
(c) ₹ 26,000 (d) ₹ 27,250

75. A invested ₹4400 at 10% and ₹7500 at 8% simple interest. What amount (in ₹) will he get from his investments after 12 years?

SSC CHSL 11/08/2023 (Shift-01)

(a) 24,830 (b) 24,380
(c) 28,380 (d) 28,840

76. At simple interest a sum of ₹ 6400 becomes ₹ 8320 in 3 years. What will ₹ 7200 become in 5 years at the same rate ?

SSC CGL 21/07/2023 (Shift-01)

(a) ₹10200 (b) ₹10600
(c) ₹10800 (d) ₹10400

77. In how many years will the simple interest on a sum of money be equal to the principal at the rate of $2\frac{6}{7}\%$ per annum?

SSC CHSL 01/07/2024 (Shift-01)

(a) 35 years (b) 33 years
(c) 37 years (d) 34 years

78. The difference between the simple interest on a sum of money for $3\frac{1}{2}$ years at the rate of 12% per annum and simple interest on the same sum of money for $4\frac{1}{2}$ years at 10% per annum is ₹360. Find the sum (in ₹).

SSC Phase XII 21/06/2024 (Shift-02)

(a) 16,000 (b) 12,000
(c) 14,000 (d) 10,000

79. A sum of Rs.2,430 gives a simple interest of Rs.1,093.50 in 3 years. The rate of interest per annum is:

SSC CHSL 10/07/2024 (Shift-01)

(a) 15% (b) 10%
(c) 20% (d) 25%

80. The difference between the simple interests on the principal of ₹500 at an interest rate of 5% per annum for 3 years and 4% per annum for 4 years is:

SSC CGL 23/09/2024 (Shift-01)

(a) Rs.7.5 (b) Rs.5
(c) Rs.15 (d) Rs.10

81. The simple interest on a sum of money for $1\frac{1}{2}$ years at 10% per annum is Rs.30 more than the simple interest on the same sum for 1 year at 12% per annum. Find the sum.

SSC CHSL 02/07/2024 (Shift-02)

(a) Rs.1,000 (b) Rs.1,050
(c) Rs.1,250 (d) Rs.1,200

82. An equal sum of money was lent to P and Q at 8.6% per annum for a period of 7 years and 8 years, respectively. If the difference in interest paid by them was Rs.172, then the sum lent to each was:

SSC CHSL 05/07/2024 (Shift-02)

(a) Rs.3,000 (b) Rs.21,15
(c) Rs.1850 (d) Rs.2,000

83. The simple interest on a certain sum for 4 years at 14% per annum is ₹6,160 less than the simple interest on the same sum at the same rate for 8 years. Find the sum.

SSC CPO 28/06/2024 (Shift-03)

(a) ₹ 10,000 (b) ₹ 9,000
(c) ₹ 11,000 (d) ₹ 12,000

84. The simple interest on a certain sum for 4 years at the rate of 15% p.a. is ₹ 4,500 less than the simple interest on the same sum for 6 years at the same rate of interest. Find the sum.

SSC MTS 06/09/2023 (Shift-02)

(a) ₹ 15,000 (b) ₹ 14,000
(c) ₹ 13,000 (d) ₹ 12,000

85. The simple interest on a certain sum at 10% per annum for two years and three years differ by ₹ 500. Find the sum.

SSC MTS 12/09/2023 (Shift-03)

(a) ₹ 6,000 (b) ₹ 4,500
(c) ₹ 5,500 (d) ₹ 5,000

86. The simple interest on a certain sum for 3 years at 8% per annum is ₹9120 less than the simple interest on the same sum for 7 years at 8% per annum. Find the sum.

SSC CHSL 03/08/2023 (Shift-01)

(a) ₹ 28,500 (b) ₹ 28,250
(c) ₹ 28,750 (d) ₹ 28,000

87. The simple interest of a sum of money in 6 years at the rate of 15% per annum is ₹1,440 less than the simple interest accrued on the same sum in 9 years at 18% per annum. What is the sum of money (in ₹)?

SSC CHSL 11/08/2023 (Shift-04)

(a) 1,800 (b) 2,000
(c) 2,700 (d) 2,400

88. What will be the difference between the interest on a sum of ₹2,000 at 7% per annum for 3 years and that on a sum of ₹ 3,200 at 6% per annum for 2 years?

SSC CHSL 20/03/2023 (Shift-01)

(a) ₹ 36 (b) ₹ 44
(c) ₹ 30 (d) ₹ 40

89. The difference of simple interest from two banks on ₹ 8,000 in 3 years is ₹ 800. If the rate of interest per annum in two banks are R_1 and R_2, then what is the value of $R_1 - R_2$? (Where $R_1 > R_2$)

SSC CGL TIER-II 02/03/2023

(a) $5\frac{1}{3}\%$ (b) $3\frac{1}{3}\%$
(c) $1\frac{1}{3}\%$ (d) $2\frac{1}{3}\%$

90. When two equal amounts are deposited for 5 years and 3 years at the rate of 7% and 9% per annum respectively, the difference of their simple interest is ₹ 475. Then find the deposited amount?

SSC CGL 07/03/2020 (Shift-03)

(a) ₹ 5,837.5 (b) ₹ 5,937.5
(c) ₹ 5,992.5 (d) ₹ 6,037.5

91. What is the present worth of ₹ 1,100 due in 2 years at 5% simple interest per annum ?

SSC CGL 26/07/2023 (Shift-03)

(a) ₹ 3,000 (b) ₹ 2,000
(c) ₹ 1,000 (d) ₹ 1,500

92. The simple interest on a sum for 5 years is ₹ 7590. The rate of interest for the first 3 years is 6 percent per annum and for the next 2 years is 14 percent per annum. What is the sum?

SSC MTS 16/06/2023 (SHIFT-03)

(a) ₹ 17000 (b) ₹ 15000
(c) ₹ 14000 (d) ₹ 16500

93. Sum of ₹20000 and ₹40000 are given on simple interest at the rate of 10 percent and 15 percent per annum respectively for three years. What will be the total simple interest?

SSC CGL TIER-II 08/08/2022

(a) ₹36000 (b) ₹32000
(c) ₹28000 (d) ₹24000

94. A borrows a sum of ₹90,000 for 4 years at 5% simple interest. He lends it to B at 7% for 4 years at simple interest. What is his gain (in ₹)?

SSC CGL 21/04/2022 (Shift-03)

(a) 8,000 (b) 7,200
(c) 7,500 (d) 9,000

95. A sum of ₹ 10,500 amounts to ₹ 13,825 in $3\frac{4}{5}$ years at a certain rate percent per annum simple interest. What will be the simple interest on the same sum for 5 years at double the earlier rate?

SSC CGL TIER-II 13/09/2019

(a) ₹ 8,470 (b) ₹ 8,750
(c) ₹ 8,670 (d) ₹ 8,560

96. The simple interest on a sum of money is $\frac{9}{45}$ of the sum. If the number of years is numerically 5 times of rate per cent per annum, then find the rate per cent per annum.

SSC Phase XII 26/06/2024 (Shift-04)

(a) 5% (b) 2%
(c) 7% (d) 3%

97. Archana took a loan of ₹78,000 from a bank on 24th January 2012 at $8\frac{3}{4}\%$ per annum simple interest and paid it back on 18th June 2012. Find the total amount paid by Archana. (Approximated to nearest integer)

SSC CGL 19/07/2023 (Shift-03)

(a) ₹80,723 (b) ₹90,730
(c) ₹85,733 (d) ₹88,730

◆ TYPE – II ◆

CONCEPT OF TIME

98. A certain sum of money becomes 4 times in 12 years when invested at simple interest. In how many years will it become 10 times of itself at the same rate?

SSC MTS 18/10/2021 (Shift-02)

(a) 60 (b) 48
(c) 24 (d) 36

99. A certain sum of money becomes seven times itself when invested at a certain rate of simple interest, in 14 years. How much time (in years, rounded off to 2 decimal places) will it take to become 18 times itself at the same rate?

SSC CGL 12/09/2024 (Shift-01)

(a) 27.33 (b) 39.67
(c) 42.78 (d) 35.5

100. An amount becomes double in 7 years on simple interest. The amount would be four times in ____ years on the same rate of simple interest.

SSC CHSL 01/07/2024 (Shift-02)

(a) 14 (b) 28
(c) 21 (d) 18

101. A sum of money becomes five times its original value in 15 years when invested at a certain simple interest rate. If the sum was invested twice the time at the same rate of interest, what would be the final amount?

SSC CHSL 08/07/2024 (Shift-03)

(a) The money becomes 7 times its original value
(b) The money becomes 9 times its original value
(c) The money becomes 6 times its original value
(d) The money becomes 8 times its original value

102. A person deposited some amount of money in the bank at simple interest. After 20 years, the amount became nine times the amount deposited. In how many years will the amount become 13 times the amount if the interest rate remains the same?

SSC CPO 27/06/2024 (Shift-03)

(a) 30 (b) 25
(c) 28 (d) 23

103. In a certain time, a sum becomes 5 times at the rate of 6% per annum on simple interest. At what rate of interest, the same sum becomes 8 times in the same duration?

SSC MTS 08/09/2023 (Shift-02)

(a) 8.5% (b) 12.5%
(c) 5.5% (d) 10.5%

104. An amount becomes double in 8 years on simple interest. In how many years would ₹25,000 become ₹1,00,000 with the same rate of interest?

SSC CGL 18/07/2023 (Shift-04)

(a) 32 (b) 28
(c) 16 (d) 24

105. A sum of money doubles itself in 4 years at simple interest. In what time will it become 7 times at the same rate of interest?

SSC CHSL TIER-II 26/06/2023

(a) 24 years (b) 23 years
(c) 21 years (d) 25 years

106. A sum of money doubles itself in 7 years at simple interest. In how much time will it becomes 5 times of itself?

SSC CGL 12/12/2022 (Shift-04)

(a) 25 years (b) 28 years
(c) 23 years (d) 21 years

107. At what rate percent per annum simple interest, a sum of money triples itself in 16 years ?

SSC CGL 26/07/2023 (Shift-01)

(a) 11.5% (b) 11%
(c) 12% (d) 12.5%

108. An amount will be tripled itself in 15 years at a certain rate of simple interest per annum. The rate of interest per annum is:

SSC Phase XII 26/06/2024 (Shift-03)

(a) $13\frac{1}{5}\%$ (b) $11\frac{1}{3}\%$
(c) $13\frac{1}{3}\%$ (d) $14\frac{1}{3}\%$

109. A sum of money becomes seven times itself in 16 years at simple interest rate per annum. Find the annual interest rate.

SSC MTS 05/09/2023 (Shift-03)

(a) 39.2% (b) 20.3%
(c) 37.5% (d) 25.8%

110. A financial institute claims that it returns three times the principal in 25 years on a certain rate of simple interest per annum What is the rate of simple interest?

SSC CHSL 03/08/2023 (Shift-04)

(a) 8% (b) 6%
(c) 4% (d) 5%

111. At a certain annual rate (rounded off to the nearest integer) of simple interest, a sum of money becomes nine times its original value in 21 years. By how much does the rate of interest change if the same of money has to becomes 12 times its original value in 25 years?

SSC CHSL 10/08/2023 (Shift-02)

(a) Decreases by 6%
(b) Increases by 6%
(c) Increases by 8%
(d) Decreases by 8%

112. At what annual rate (rounded off to the nearest integer) of simple interest will a sum of money become five times its initial value in 18 years?

SSC CHSL 10/08/2023 (Shift-03)

(a) 18% (b) 20%
(c) 22% (d) 24%

113. The rate at which a sum becomes four times of itself in 12 years at simple interest will be:

SSC CGL 24/07/2023 (Shift-01)

(a) 20% (b) 25%
(b) 35% (d) 30

114. A sum becomes triple in 9 years. Find the annual rate of simple interest.

SSC Phase-XI 30/06/2023 (Shift-03)

(a) $33\frac{1}{3}\%$ (b) $22\frac{2}{9}\%$
(c) $27\frac{1}{9}\%$ (d) $38\frac{2}{9}\%$

115. What is that rate of simple interest at which a sum of money becomes three times of itself in 36 years?

SSC MTS 14/06/2023 (SHIFT-01)

(a) 7.28% (b) 6.86%
(c) 5.55% (d) 6.28%

116. A sum of money becomes $\frac{8}{7}$ of itself in 2 years at a certain rate of simple interest. The rate per annum is:

SSC CGL 20/07/2023 (Shift-01)

(a) $6\frac{3}{7}\%$ (b) $8\frac{1}{7}\%$
(c) $7\frac{1}{7}\%$ (d) $7\frac{3}{7}\%$

117. In a certain duration of time, a sum become 2 times itself at the rate of 5% per annum simple interest. What will be the rate of interest if the same sum becomes 5 times itself in the same duration?

SSC CGL 08/12/2022 (Shift-01)

(a) 20 % (b) 16 %
(c) 10 % (d) 18 %

118. In how many least number of complete years a sum of money become more than four times of itself at the rate of 50 percent per annum on simple interest?

SSC CGL 09/12/2022 (Shift-04)

(a) 9 years (b) 7 years
(c) 6 years (d) 5 years

◆ TYPE – III ◆

RATE IS X% HIGHER OR LOWER

119. An amount of P was put at a certain rate for 4 years. If it had been put at a 6% higher rate for the same period, it would have fetched ₹600 more interest. What value of 2.5 P?

SSC CHSL 10/08/2023 (Shift-04)

(a) ₹3,750 (b) ₹6,250
(c) ₹4,850 (d) ₹2,500

120. A certain sum of money is given at a certain rate of simple interest for 6 years. Had it been given at 7% higher rate, it would have fetched Rs.1,512 more. Find the sum (in ?).

SSC CGL 18/09/2024 (Shift-01)

(a) ₹3,200 (b) ₹3,600
(c) ₹3,100 (d) ₹4,20

121. A certain sum of money is given at a certain rate for 3 years. Had it been given at 5% higher rate, it would have fetched ₹600 more. Find the sum.

SSC CGL 08/12/2022 (Shift-04)

(a) ₹8,000 (b) ₹5,000
(c) ₹6,000 (d) ₹4,000

122. A person lent certain sum of money at the annual rate of 25 percent on simple interest. In 6 years the interest amounted to ₹360 more than the sum lent. What is the sum?

SSC CGL 01/12/2022 (Shift-02)

(a) ₹600 (b) ₹360
(c) ₹720 (d) ₹540

123. If the annual rate of simple interest increases from 11% to $17\frac{1}{2}\%$ then a person's yearly income increases by ₹1,071.20. The simple interest (in ₹) on the same sum at 10% for 5 years is:

SSC CPO 24/11/2020 (Shift-01)

(a) 16,480 (b) 9,120
(c) 7,250 (d) 8,240

124. A man deposited ₹ 10,000 at simple interest in a fund. The interest rate on the fund increases by 4% every year. If the interest rate at the time of the amount deposited was 8%, what is the interest earned (in ₹) by him after 5 years?

SSC CHSL 02/08/2023 (Shift-04)

(a) 6,000 (b) 8,400
(c) 5,800 (d) 8,000

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125. A person took a loan at 5% per annum simple interest during the first year and with an increase of 0.5% simple interest every year from the second year onwards. After 4 years, he paid ₹ 4,600 as a total interest to settle the loan completely. How much was the loan?

SSC CGL 17/07/2023 (Shift-03)

(a) 20,000 (b) 19,000
(c) 18,000 (d) 21,000

126. The interest on a certain deposit at 4.5 % p.a, is ₹135 in one year. How much will the additional interest in one year be on the same deposit at 5% p.a?

SSC CGL 24/07/2023 (Shift-03)

(a) ₹ 16 (b) ₹ 15
(c) ₹ 14 (d) ₹ 18

127. A sum of ₹ 800 amounts to ₹ 1,040 in 3 years at simple interest. If the interest rate is increased by 3%, find the amount.

SSC MTS 14/09/2023 (Shift- 02)

(a) ₹ 1112 (b) ₹ 1212
(c) ₹ 1012 (d) ₹ 1102

128. Simple interest on a certain sum is one-fifth of the sum and the interest rate percent per annum is 5 times the number of years. If the rate of interest increases by 3%, then how much will the simple interest (in Rs.) be on Rs.5,600 for 6 years?

SSC CGL 10/09/2024 (Shift-03)

(a) 4668 (b) 4168
(c) 4268 (d) 4368

129. A certain sum of money is given at a certain rate of simple interest for 4 years. Had it been given at 11% higher rate for the same time, it would have fetched ₹1320 more. Find the sum (in ₹).

SSC CPO 28/06/2024 (Shift-02)

(a) 2500 (b) 3000
(c) 4580 (d) 3240

130. A person invested one-fourth of the sum of ₹ 25,000 at a certain rate of simple interest and the rest at 4% p.a. higher rate. If the total interest received for 2 years is ₹ 4,125. What is the rate at which the second sum was invested?

SSC CGL TIER-II 13/09/2019

(a) 9.5% (b) 9.25%
(c) 9.255% (d) 7.5%

◆TYPE – IV◆

MUNNI METHOD

131. A certain sum of money amounts to ₹1,860 in 2 years and to ₹2,130 in $3\frac{1}{2}$ years at simple interest. Find the sum and the rate of interest, respectively.

SSC CHSL 10/07/2024 (Shift-03)

(a) ₹ 1,500, 12%
(b) ₹ 1,200, 10%
(c) ₹ 1,500, 15%
(d) ₹ 1,200, 12%

132. A sum of money at a fixed rate of simple interest amounts to ₹1,630 in 3 years and to ₹1,708 in 4 years. Find the sum (in ₹).

SSC CGL 19/07/2023 (Shift-04)

(a) 1132 (b) 1296
(c) 1396 (d) 1448

133. A sum amounts to ₹7,656 in 4 years and to ₹8,120 in 5 years at a certain simple interest rate per cent per annum. The rate of interest is:

SSC CPO 05/10/2023 (Shift-02)

(a) 4% (b) 3%
(c) 7% (d) 8%

134. A certain sum of money is lent out at simple interest. If that money becomes Rs.24,000 in 2 years and Rs.32,000 in 4 years, the annual rate of interest is:

SSC CHSL 10/07/2024 (Shift-02)

(a) 30% (b) 16%
(c) 25% (d) 20%

135. A certain sum of money amounts to ₹1250 in 4 years and to ₹1520 is $5\frac{1}{2}$ years at a certain rate of simple interest. Find the rate of interest per annum (correct to two places of decimals.)

SSC Phase XII 25/06/2024 (Shift-02)

(a) 33.96% (b) 23.96%
(c) 43.96% (d) 53.96%

136. If a sum of money becomes ₹ 6,000 in 3 years and ₹10,500 in 7 years and 6 months at the same rate of simple interest, then what is the rate of interest?

SSC CHSL 07/08/2023 (Shift-04)

(a) $33\frac{1}{3}\%$ (b) $25\frac{1}{2}\%$
(c) $45\frac{2}{3}\%$ (d) $66\frac{1}{3}\%$

137. A sum of money at simple interest amounts to ₹ 1,200 in 3 years and to ₹ 1,350 in 4 years. The sum is:

SSC CGL 26/07/2023 (Shift-04)

(a) ₹ 650 (b) ₹ 850
(c) ₹ 450 (d) ₹ 750

138. A certain sum, at a certain rate of simple interest, amounts to ₹2,225 in 4 years and to ₹2,606 in 8 years. Find the sum (in ₹).

SSC Phase XI 27/06/2023 (Shift-02)

(a) 1,344 (b) 1,240
(c) 1,143 (d) 1,844

139. What sum of money amounts to ₹2,600 in 2 years and to ₹2,700 in 3 years at a fixed rate of simple interest annually?

SSC Phase XI 30/06/2023 (Shift-02)

(a) ₹2,300 (b) ₹2,200
(c) ₹2,600 (d) ₹2,400

140. On simple interest, a certain sum becomes ₹ 59,200 in 6 years and ₹ 72,000 in 10 years. If the rate of interest had been 2% more, then in how many years would the sum have become ₹76,000?

SSC CGL 12/04/2022 (Shift-01)

(a) 10 (b) 9
(c) 8 (d) 7

141. A certain sum of money lent out at simple interest amounts to ₹ 12,600 in 2 years and ₹ 16,200 in 4 years. The rate percent per annum is:

SSC MTS 11/09/2023 (Shift-03)

(a) 25% (b) 20%
(c) $12\frac{6}{7}\%$ (d) $17\frac{1}{2}\%$

142. A sum of money invested at a certain rate of simple interest per annum amounts to ₹14,522 in seven years and to ₹18,906 in eleven years. Find the sum invested (in ₹).

SSC CGL 17/07/2023 (Shift-02)

(a) 6850 (b) 6900
(c) 6800 (d) 6750

◆TYPE – V◆

BASED ON ALLIGATION

143. A total of Rs.2,00,000 is divided into two parts for investing in different banks on simple interest. One yields 4% p.a. while the other yields 6% p.a. If the total interest at the end of one year is equivalent to 4.7% p.a. on the whole amount, the amount (in Rs.) invested in each bank is ________, respectively.

SSC CGL 18/09/2024 (Shift-02)

(a) 1,30,000 and 70,000
(b) 1,45,000 and 55,000
(c) 1,20,000 and 80,000
(d) 1,60,000 and 40,000

144. Kiran lent ₹4,000 to two persons such that one part of it at the rate of 8% per annum and the remaining part at the rate of 10% per annum. He got an annual simple interest of ₹352. Then the sum lent at 10% is:

SSC CGL 10/09/2024 (Shift-01)

(a) ₹1,800 (b) ₹2,200
(c) ₹2,400 (d) ₹1,600

145. An amount of Rs.8,000 was invested for 2 years, partly in scheme 1 at the rate of 5% simple interest per annum and the rest in scheme 2 at the rate of 4% simple interest per annum. The total interest received at the end was ₹720. The amount of money invested in scheme 1 is:

SSC CHSL 04/07/2024 (Shift-04)

(a) ₹3,640 (b) ₹7,200
(c) ₹4,400 (d) ₹4,000

146. Mr Gogia invested an amount of ₹13,900 divided into two different schemes A and B at the simple interest rate of 14% pa and 11% pa, respectively. If the total amount of simple interest earned in 2 years is ₹3,508, what was the amount invested in scheme B?

SSC Phase XII 21/06/2024 (Shift-01)

(a) ₹7200 (b) ₹7500
(c) ₹6400 (d) ₹6500

147. A borrows ₹20,000 from B and C. B lends him a certain sum of money at 25% simple interest per annum, while C lends him the remaining sum of money at 21% simple interest per annum. The total interest paid by A in one year is ₹4,500. The sum (in ₹) borrowed from B is:

SSC Phase XII 21/06/2024 (Shift-01)

(a) 12,500 (b) 6,000
(c) 9,000 (d) 7,500

148. The simple interest earned on ₹2,800 at a rate of 10% per annum for 3 years is ₹x and ₹1,736 is the simple interest earned on ₹6,200 at a rate of 14% for y years, then the value of $\frac{x}{y}$ is:

SSC CGL TIER-II 26/10/2023

(a) 550 (b) 380
(c) 420 (d) 140

149. A money lender lent ₹30,000 in two parts, one at the rate of 8% and the other at 9%. If the total annual simple interest on the amount is ₹2,650, then what is the amount of money lent the rate of 8%?

SSC CHSL 14/08/2023 (Shift-04)

(a) ₹6,600 (b) ₹5,000
(c) ₹4,500 (d) ₹5,500

150. S deposits a total of ₹ 50,000 in two accounts which give 8% and 12 % simple interest annually, respectively. After one year, he gets a total ₹5,200. How much money does he deposit in the account with a 12 % interest rate?

SSC CGL 25/07/2023 (Shift-04)

(a) 30000 (b) 20000
(c) 32000 (d) 25000

151. A sum of ₹ 3500 is lent out at simple interest in two parts. One part at the annual rate of 7% and another part at- the annual rate of 5%. If the total annual interest is ₹ 210, then what is the sum lent out at the rate of 7 percent?

SSC MTS 20/06/2023 (Shift-02)

(a) ₹1750 (b) ₹2000
(c) ₹1500 (d) ₹2250

152. Rajesh invested ₹10,000 by dividing it into two different investment schemes, A and B, at simple interest rates of 8% and 10%, respectively. If the total interest earned in 2 years is ₹1,680, the amount invested in scheme A is:

SSC CPO 03/10/2023 (Shift-01)

(a) ₹4,000 (b) ₹2,000
(c) ₹6,000 (d) ₹8,000

153. A sum of ₹5,000 was lent to two people, one at the rate of 16% and the other at the rate of 24%. If the simple interest after one year is ₹960, what is the sum lent at the higher rate?

SSC CHSL 11/07/2024 (Shift-02)

(a) ₹1,500 (b) ₹3,000
(c) ₹2,500 (d) ₹2,000

154. A man invests a total sum of ₹10,000 in a company. A part of the sum was invested at 10% simple interest per annum and the remaining part at 15% simple interest per annum. If the total interest accrued to him in two years equals ₹2,400, the sum invested at 15% simple interest per annum is:

SSC CGL 14/07/2023 (Shift-03)

(a) ₹8,000 (b) ₹4,000
(c) ₹6,000 (d) ₹5,000

◆ TYPE – VI ◆
CONCEPT OF TOTAL SI

155. A person borrowed some money at the rate of 8% per annum for the first two years, at the rate of 11% per annum for the next three years, and at the rate of 16% per annum for the period beyond five years. If he pays a total interest of Rs.21,400 at the end of nine years, how much money did he borrow (round to the nearest unit) ?

SSC CHSL 03/07/2024 (Shift-01)

(a) Rs.11,938 (b) Rs.18,738
(c) Rs.938,15 (d) Rs.18,938

156. Ramesh borrowed some money at rate of 5% per annum for the first four years, 8% per annum for the next six years, and 12% per annum for the period beyond ten years. If the total interest paid by him at the end of twelve years is ₹9,016, then find the money borrowed by Ramesh.

SSC CPO 03/10/2023 (Shift-03)

(a) ₹9,800 (b) ₹9,616
(c) ₹9,816 (d) ₹9,016

157. Ravi borrowed some money at the rate of 5% per anuum for the first three years ,8% per annum for the next two years, and 10% per annum for the period beyond 5 years. If he paid a total simple interest of ₹12,750 at the end of 7 years, then how much money did he borrow?

SSC CHSL 07/08/2023 (Shift-01)

(a) ₹25,000 (b) ₹26000
(c) ₹27000 (d) 24,000

158. A sum of money earns a simple interest at 7.25% per annum for the first eight years, at 8.5% for the next six years, and at 6.5% for the final four years. If the total interest earned during these eighteen years was ₹35,100, what was the original sum invested (in ₹)?

SSC CGL 20/07/2023 (Shift-02)

(a) 25,800 (b) 25,500
(c) 26,400 (d) 26,000

159. The rate of interest for the first 2 years is 6% p.a. for next 3 years is 10% p.a. and for the period beyond 5 years is 12% pa. If a person gets ₹ 12,771 as simple interest after 7 years, then what money did he invest?

SSC CGL TIER-II 16/11/2020)

(a) ₹ 19,450 (b) ₹19,350
(c) ₹ 19,300 (d) ₹20,000

160. Ramesh has ₹18,000. He deposited ₹7,000 in a bank at the rate of 5% per annum and Rs.6,000 in other bank at the rate of 6% per annum simple interest. If he received ₹1,160 as simple interest at the end of one year, then the rate of interest per annum on rest of the capital is equal to:

SSC CGL 09/09/2024 (Shift-03)

(a) 10% (b) 11%
(c) 9% (d) 8%

161. A man invested a sum of Rs. 5,000 on simple interest for 5 years such that the rate of interest for the first 2 years is10% per annum, for the next 3 years it is 12% per annum How much interest (in Rs), will he earn at the end of 5 years?

SSC CHSL 03/07/2024 (Shift-02)

(a) 2800 (b) 2450
(c) 3000 (d) 3180

162. A person invests ₹ 5,000 at a simple interest rate of 5% per annum for 5 years. At the end of 5 years, she reinvests the entire amount at the same rate of interest for another 3 years. What will be the total interest earned by the person at the end of 8 years?

SSC MTS 13/09/2023 (Shift-03)

(a) ₹ 2,256.50 (b) ₹ 2,156.50
(c) ₹ 2,187.50 (d) ₹ 2,323.50

◆ TYPE – VII ◆
CONCEPT OF EQUAL SI

163. A person invested a total of ₹ 9,000 in three parts at 3%, 4% and 6% per annum on simple interest. At the end of a year, he received equal interest in all three cases. The amount invested at 6% is

SSC CHSL 16/10/2020 (Shift-03)

(a) ₹2,000 (b) ₹3,000
(c) ₹4,000 (d) ₹5,000

164. If the simple interest on Rs.7,200 in 3 years at the rate of 16% per annum equals the simple interest on nnum, give the same interest as ₹9,600 at the rate of x% per annum in 4 years. The value of x is equal to:

SSC CGL 17/09/2024 (Shift-01)

(a) 9 (b) 11
(c) 8 (d) 10

165. In how much time will Rs.5,000 at 4% per annum simple interest produce the same interest as nnum, give the same interest as ₹8,000 in $2\frac{1}{2}$ years at 8% per annum simple interest?

SSC CGL 26/09/2024 (Shift-03)

(a) 8 years (b) 5 years
(c) 4 years (d) 2 years

166. In what time will ₹10,000 at 4% per annum, give the same interest as ₹8,000 does in 4 years at 5% simple interest?

SSC CGL 14/07/2023 (Shift-01)

(a) 5 year (b) 3 year
(c) 4 year (d) 6 year

167. The simple interest on ₹ 800 for 6 years at 5.5% per annum is equal to the simple interest on ₹ 600 at 4% per annum for a certain period of time. The period of time is:

SSC CGL 24/07/2023 (Shift-02)

(a) 11 years (b) 9 years
(c) 12 years (d) 10 years

168. The simple interest earned on ₹7,000 in 2 years at the rate of R% per annum equals to the simple interest earned on ₹5,000 at the rate of 5% per annum in 14 years. The value of R (in percentage) is:

SSC Phase XI 27/06/2023 (Shift-01)

(a) 28% (b) 15%
(c) 25% (d) 20%

169. A man invests an amount of ₹ 1,05,750 at simple interest in the name of his son, daughter and his wife in such a way that they get the same interest after 3, 4 and 5 years, respectively. If the rate of interest is 5% per annum, then the amount invested for the wife is:

SSC CHSL 12/08/2021 (Shift-03)

(a) ₹ 25,000 (b) ₹ 28,000
(c) ₹ 27,000 (d) ₹ 30,000

◆ TYPE – VIII ◆

MISCELLANEOUS QUESTIONS

170. An amount of ₹12,000 was borrowed at a certain rate of simple interest. After four months, ₹ 6,000 more was borrowed and rate of interest on the total principal was doubled than that of the previous rate. At the end of the year, 2800 was paid as the interest. find the rate that was applicable in the initial.

SSC CHSL 12/10/ 2020 (Shift-01)

(a) 14% (b) 16%
(c) 12% (d) 10%

171. A man take a loan of some amount at some rate of simple interest. After three years, the loan amount is doubled and the rate of interest is decreased by 2%. After 5 years, if the total interest paid on the whole is the ₹13,600, which is equal to the same when the first amount was taken for $11\frac{1}{3}$ years, then the loan taken initially is :

SSC CHSL 14/10/2020 (Shift-02)

(a) ₹13,600 (b) ₹12,500
(c) ₹10,000 (d) ₹12,000

172. If a sum of ₹5,000 is taken at a simple rate of interest of 15% per annum for 3 years and another sum of ₹8,000 is taken at a simple interest of 12% per annum for 4 years, the positive difference of the interests paid is:

SSC CGL 09/09/2024 (Shift-02)

(a) ₹1643 (b) ₹1590
(c) ₹1286 (d) ₹1378

173. The interest accrued on a sum of ₹16,000 lent at a simple interest rate of 14% p.a. for the time in those many years, which gives a simple interest of three-fifths of a certain sum at 10% p.a., is:

SSC CGL 11/09/2024 (Shift-01)

(a) ₹13,440 (b) ₹12,970
(c) ₹15,360 (d) ₹14,280

174. S borrowed some amount from R and promised to pay him 8% interest. Then S invested the borrowed amount in a scheme, upon which he earned a profit of 5% after paying R, the principal amount with interest. How much percentage R would have gained, if he would have invested in the scheme directly?

SSC CGL 11/09/2024 (Shift-02)

(a) 13.4% (b) 13%
(c) 14.4% (d) 14%

175. A trader owes a merchant ₹9,810 due in 1 year, but the trader wants to settle the account after 6 months. If the rate of simple interest is 9% per annum, how much cash (in ₹) should he pay?

SSC CGL 13/09/2024 (Shift-02)

(a) 9,550 (b) 9,450
(c) 9,540 (d) 9,405

176. A sum of ₹10,000 is taken as a loan by Rajesh at a rate of 15% p.a. simple interest for 2 years. But Rajesh could not repay it at the agreed time and asked for an extension of two more years. So, the lender included the interest amount for the period as principal for the next two years at the same rate of interest. The total amount paid by Rajesh at the end of 4 years is:

SSC CGL 13/09/2024 (Shift-03)

(a) ₹18,590 (b) ₹16,900
(c) ₹17,650 (d) ₹15,630

177. In a bank, 6% interest is given on the deposited amount. The bank then invests the money in the stock market and is able to earn Rs.30,000 for every Rs.3,00,000. How much money is the bank earning finally if the total amount deposited in the bank is ₹60,00,000?

SSC CGL 17/09/2024 (Shift-03)

(a) Rs.3,00,000 (b) Rs.6,40,000
(c) Rs.2,40,000 (d) Rs.3,60,000

178. Reshma took a loan of Rs.12,00,000 with simple interest for as many years as the rate of interest. If she paid Rs.9,72,000 as interest at the end of the loan period, what was the rate of interest per annum ?

SSC CHSL 01/07/2024 (Shift-02)

(a) 9% (b) 7.5%
(c) 8% (d) 8.7%

179. What will be the amount due on Rs.12,000 in 2 years when the rate of simple interest on successive years is 9%and 10%, respectively?

SSC CHSL 08/07/2024 (Shift-02)

(a) Rs.14,280 (b) Rs.14,350
(c) Rs.14,250 (d) Rs.14,150

180. What will be the amount due on Rs.36,000 in 2 years when the rate of simple interest for successive years is 8%and 6%, respectively?

SSC CHSL 09/07/2024 (Shift-04)

(a) Rs.38,880 (b) Rs.40,320
(c) Rs.41,760 (d) Rs.41,040

181. The simple interest on a certain sum is one-fifth of the sum and the interest rate percent per annum is 3.2 times the number of years. If the rate of interest increases by 4%, then the simple interest (in ₹) on ₹7,500 for 4 years is:

SSC Phase XII 21/06/2024 (Shift-04)

(a) 3,600 (b) 3,000
(c) 2,500 (d) 5,100

182. A sum invested at the rate of 6% simple interest per annum grows to ₹ 1,13,880 in 5 years. What is the simple interest, If the same amount is invested for 8 years at the rate of 9% per annum?

SSC MTS 04/09/2023 (Shift-02)

(a) ₹ 60,565 (b) ₹ 65,392
(c) ₹ 58,050 (d) ₹ 63,072

183. What will be the amount due on ₹ 24,000 in 2 years when the rate of simple interest on successive years is 4% per annum and 5% per annum, respectively?

SSC MTS 06/09/2023 (Shift-03)

(a) ₹ 26,208 (b) ₹ 25,200
(c) ₹ 26,160 (d) ₹ 24,960

184. ₹ 8,000 becomes ₹ 9,800 in three years at simple interest rate. If the rate of Interest become two times of itself, then what will be the amount of the same principal in four years?

SSC MTS 11/09/2023 (Shift-02)

(a) ₹ 13,500 (b) ₹ 11,800
(c) ₹ 12,800 (d) ₹ 10,800

185. Simple interest on a certain sum is one-fourth of the sum and the interest rate per annum is four times the number of years. If the rate of interest increases by 2%, then how much will the simple interest (in ₹) on ₹ 3600, for 6 years.

SSC CHSL 09/08/2023 (Shift-01)

(a) 2562 (b) 2514
(c) 2692 (d) 2592

186. A money-lender claims he lends money at a simple rate of interest of 8% per annum. But he cleverly includes the interest amount in the principal when he calculates it every six months. The effective rate of interest becomes:

SSC CHSL 09/08/2023 (Shift-02)

(a) 8.16% (b) 8.2%
(c) 8.8% (d) 8.25%

187. In 't' years, the simple interest earned on a certain amount at the rate of 10% per annum is $\frac{5}{8}$th of the principle amount if the rate of interest is made three-fourth of 10% and the simple interest remains the same, which of the following statement is true about the changed value of time?

SSC CHSL 14/08/2023 (Shift-03)

(a) It remains the same as 't'.
(b) It becomes three-fourth of the time 't'.
(c) It increases to $8\frac{1}{3}$ years.
(d) It decreases to $5\frac{1}{2}$ years.

188. A man took a loan of ₹32,400 at a certain rate of simple interest per annum. The rate of interest is one-fourth of the number of years for which the loan is taken. If he paid ₹11,664 as interest at the end of the loan period, the rate of interest was:

SSC CGL 19/07/2023 (Shift-02)

(a) 3% (b) 8%
(c) 5% (d) 12%

189. A person borrows ₹20000 at the rate of 6 percent per annum on simple interest for 3 years. He immediately lends it to another person at the rate of 8.5 percent per annum on simple interest for 3 years. What is the value of gain per year?

SSC CHSL 21/03/2023 (Shift-04)

(a) ₹ 1500 (b) ₹ 500
(c) ₹ 800 (d) ₹ 200

190. A person deposited ₹15,600 in a fixed deposit at 10% per annum simple interest. After every second year he adds his interest earned to the principal. The interest at the end of 4 years is:

SSC CGL 12/12/2022 (Shift-03)

(a) ₹6,655 (b) ₹6,864
(c) ₹3,975 (d) ₹3,744

191. The simple interest on a certain sum is $\frac{1}{8}$ of the sum when the number of years is equal to half of the rate percentage per annum. Find the simple interest (in ₹) on ₹15,000 at the same rate of simple interest for 8 years.

SSC CGL 12/04/2022 (Shift-02)

(a) 5800 (b) 5000
(c) 6000 (d) 5250

192. Simple interest on a certain sum is one-fourth of the sum and the interest rate percentage per annum is 4 times the number of years. If the rate of interest increases by 2%, then what will be the simple interest (in ₹) on ₹ 5000 for 3 years?

SSC CGL 13/04/2022 (Shift-01)

(a) 300 (b) 1500
(c) 2000 (d) 1800

193. A salesperson, with a view to promote sales of an item, applies the principal of simple interest. He declares that 300 pieces of the item can be obtained immediately against cash payment, but a customer will get only 200 pieces of the item if he defers the payment for a year. What is the rate percentage of interest on the whole?

SSC MTS 05/10/2021 (Shift-01)

(a) 30% (b) 25%
(c) 50% (d) 40%

194. Two equal sums were lent on simple interest at 6% and 10% per annum respectively. The first sum was recovered two years later than the second sum and the amount in each case was ₹1105. What was the sum (in ₹) lent in each scheme?

SSC CGL 13/08/2021 (Shift-03)

(a) 900 (b) 850
(c) 936 (d) 891

195. A sum amounts to ₹ 14,395.20 at 9.25% p.a. simple interest in 5.4 years. What will be the simple interest on the same sum at 8.6% p.a. in 4.5 years?

SSC CGL TIER-II 12/09/2019

(a) ₹ 3715.20 (b) ₹ 3627
(c) ₹ 3797.76 (d) ₹ 3672

196. Ramu invested some money at 8% simple interest per annum, and it was grown up to Rs.820 in 8 years. If the same sum was invested at 20% simple interest per annum for a period of 10 years, find the amount.

SSC CHSL 10/07/2024 (Shift-04)

(a) Rs.1,000 (b) Rs.1,200
(c) Rs.1,320 (d) Rs.1,500

197. If the simple interest on a certain sum of money for 20 months at the rate of 19.2% per annum exceeds the simple interest on the same sum for 15 months at the rate of 11.2% p.a. by ₹2,920, then what is the sum (in ₹, to the nearest hundreds)?

SSC CPO 29/06/2024 (Shift-02)

(a) 16,620 (b) 12,660
(c) 16,200 (d) 16,660

198. The simple interest on a certain sum at the rate of 12.5% per annum for 6 years is ₹13,500 less than the principal. Find the simple interest.

SSC CGL 25/07/2023 (Shift-01)

(a) ₹13,500 (b) ₹54,000
(c) ₹40,000 (d) ₹40,500

199. The simple interest on an amount for 6 years at 4% p.a. is ₹ 7,500 less than the simple interest on the same amount for 11 years. Find the amount.

SSC CGL 27/07/2023 (Shift-02)

(a) ₹38,000 (b) ₹37,500
(c) ₹37,000 (d) ₹38,500

200. The simple interest on ₹2,460 will be ₹162 less than the simple interest on ₹3,000 at the rate of 5% per annum simple interest. Find the time taken in years.

SSC Phase XI 28/06/2023 (Shift-03)

(a) 4 (b) 6
(c) 5 (d) 3

201. The simple interest on a certain sum for 3 years at 14% p.a. is ₹4,200 less than the simple interest on the same sum for 5 years at the same rate. Find the sum.

SSC CGL 01/12/2022 (Shift-03)

(a) ₹16,000 (b) ₹10,000
(c) ₹15,000 (d) ₹12,000

202. A sum of ₹ 3000 becomes ₹ 6000 when invested in scheme of simple interest. If the annual rate of interest and the number of years for which the sum invested are same, then what is the annual rate of interest?

SSC CHSL 17/03/2023 (Shift-02)

(a) 5% (b) 20%
(c) 10% (d) 15%

203. Kirti invested a sum of money at a certain rate of simple interest per annum for 3 years in "Bachat scheme". Had she invested the same sum in "Shiksha scheme" for 3 years which has a 2% higher simple interest rate per annum, the investment would have fetched ₹540 more. How much did Kirti invest?

SSC MTS 05/07/2022 (Shift-03)

(a) ₹9500 (b) ₹9000
(c) ₹7000 (d) ₹8000

204. A sum was invested at simple interest at x% p.a. for $2\frac{1}{2}$ years. Had it been invested at $(x + 3)$% for the same time, it would have fetched ₹ 585 more. The simple interest on the same sum for $4\frac{2}{3}$ years at 14% p.a. is:

SSC MTS 27/10/2021 (Shift-02)

(a) ₹ 4,732 (b) ₹ 5,096
(c) ₹ 4,900 (d) ₹ 5,460

205. Aman invested a sum of money in scheme A at the rate of 8% p.a. for a period of 5 years on simple interest. He invested four times of the sum of scheme A in scheme B at the rate of 5% p.a. for 7 years on simple interest. He received a total interest amount of Rs.1,620. How much (in Rs.) did he invest in scheme B?

SSC CGL 19/09/2024 (Shift-01)

(a) 2,400 (b) 900
(c) 3,200 (d) 3,600

206. A bank charges simple interest for Rs.K at the rate of $r^{\frac{1}{2}}$ for n^2 years. Another bank charges simple interest for Rs.L at the rate of $r^{\frac{3}{2}}$ for n^3 years and gives the same interest. The ratio between K and L is:

SSC CHSL 02/07/2024 (Shift-01)

(a) $\frac{1}{r}:\frac{1}{n}$ (b) rn:1
(c) $r^2 : n^2$ (d) a $r^{\frac{1}{2}} : n^{\frac{1}{2}}$

207. A sum is deposited in a bank which gives simple interest. The sum becomes 1.25 times in 3 years. If there is a requirement of ₹7,60,000 after seven years, how much amount (in ₹) should one deposit to fulfil the requirement?

SSC CGL 07/12/2022 (Shift-02)

(a) 5,20,000 (b) 5,70,000
(c) 4,80,000 (d) 6,00,000

250. Pranav borrows a sum of Rs.335180 at the rate of 13% per annum simple interest. At the end of the first year, he repays Rs.23060 towards return of principal amount borrowed. If Pranav clears all pending dues at the end of the second year, including interest payment that accrued during the first year, how much does he pay (in Rs.) at the end of the second year?

SSC CGL 25/09/2024 (Shift-03)

(a) 398876
(b) 393949
(c) 396269
(d) 388076

251. A clock is sold for Rs.550 cash or in the installment scheme, for Rs.250 cash down payment and Rs.310 after one month. Find the rate of interest charged in the installment scheme.

SSC CHSL 04/07/2024 (Shift-01)

(a) 40% (b) 20%
(c) 35% (d) 45%

252. Rahna decided to buy a scooty that costs Rs.40,000. The shopkeeper agreed to sell the scooty under the condition of Rs.25,000 cash down payment of Rs.4,000 each month for four months. Find the rate of interest at which the shopkeeper sold the scooty under the installment scheme.

SSC CHSL 04/07/2024 (Shift-03)

(a) 33% (b) $10\frac{1}{3}\%$
(c) $18\frac{1}{2}\%$ (d) $16\frac{1}{2}\%$

253. A laptop charger is sold for Rs.2,540 in cash or for a down payment of Rs.1,340 in cash together with Rs.1,205 to be paid after one month. Find the rate of interest charged in the instalment scheme.

SSC CHSL 11/07/2024 (Shift-01)

(a) 20% p.a. (b) 10% p.a.
(c) 5% p.a. (d) 15% p.a.

254. In a store, Arun has two options to buy a mobile phone, either he can pay the full amount of ₹2,500 or he may buy at an instalment scheme, i.e. ₹520 in down payment and four equal installments, rate of interest being charged at 25% p.a. simple interest. Arun buys a mobile phone on the installment scheme. What is the monthly installment for Arun?

SSC CPO 05/10/2023 (Shift-03)

(a) 510 (b) 530
(c) 550 (d) 520

255. P borrows a sum of ₹5,00,000 from a bank which charges simple interest at the rate of 18% per annum at the beginning of the year. He pays 11 equal monthly installments of ₹40,000 and mortgages his bike at the end of the year to pay the remaining amount. What is the value of the mortgages bike?

SSC Phase XI 27/06/2023 (Shift-02)

(a) 1,50,000
(b) 1,75,000
(c) 1,25,000
(d) 1,10,000

256. A car with a price of ₹6,50,000 is bought by making some down payment. On the balance, a simple interest of approx mate 10% is charged in lump sum and the money is to be paid in 20 equal annual installments of ₹25,000. How much is the down payment?

SSC CGL 06/12/2022 (Shift-02)

(a) ₹1,55,945 (b) ₹1,95,455
(c) ₹1,94,555 (d) ₹1,45,955

257. A person borrows ₹1,00,000 from a bank at 10% per annum simple interest and clears the debt in five years. If the instalment paid at the end of the first, second, third and fourth years to clear the debt are ₹10,000, ₹20,000, ₹30,000 and ₹40,000, respectively, what amount should be paid at the end of the fifth year to clear the debt?

SSC CGL 12/12/2022 (Shift-01)

(a) ₹38,250 (b) ₹30,000
(c) ₹40,450 (d) ₹36,450

258. A cell phone is available for ₹600 or for ₹300 cash down payment together with ₹360 to be paid after two months. Find the rate of interest charged under this scheme.

SSC CGL 24/09/2024 (Shift-02)

(a) 60% (b) 120%
(c) 20% (d) 50%

259. What annual instalment will discharge a debt of ₹10,192 due in 3 years at 10% simple interest?

SSC CPO 27/06/2024 (Shift-02)

(a) ₹3,144.48 (b) ₹3,044.48
(c) ₹3,088.48 (d) ₹3,188.48

ANSWER KEY

1.	(c)	2.	(b)	3.	(d)	4.	(d)	5.	(a)	6.	(c)	7.	(c)	8.	(d)	9.	(b)	10.	(d)
11.	(a)	12.	(b)	13.	(a)	14.	(d)	15.	(a)	16.	(d)	17.	(c)	18.	(c)	19.	(c)	20.	(c)
21.	(c)	22.	(b)	23.	(b)	24.	(b)	25.	(b)	26.	(d)	27.	(c)	28.	(d)	29.	(c)	30.	(b)
31.	(c)	32.	(b)	33.	(a)	34.	(c)	35.	(c)	36.	(c)	37.	(c)	38.	(c)	39.	(c)	40.	(c)
41.	(b)	42.	(b)	43.	(d)	44.	(a)	45.	(c)	46.	(b)	47.	(a)	48.	(b)	49.	(d)	50.	(c)
51.	(c)	52.	(a)	53.	(a)	54.	(a)	55.	(b)	56.	(d)	57.	(c)	58.	(c)	59.	(b)	60.	(c)
61.	(c)	62.	(b)	63.	(d)	64.	(a)	65.	(c)	66.	(b)	67.	(b)	68.	(b)	69.	(b)	70.	(a)
71.	(a)	72.	(a)	73.	(c)	74.	(d)	75.	(b)	76.	(c)	77.	(a)	78.	(b)	79.	(a)	80.	(b)
81.	(a)	82.	(d)	83.	(c)	84.	(a)	85.	(d)	86.	(a)	87.	(b)	88.	(a)	89.	(b)	90.	(b)
91.	(c)	92.	(d)	93.	(d)	94.	(b)	95.	(b)	96.	(b)	97.	(a)	98.	(d)	99.	(b)	100.	(c)
101.	(b)	102.	(a)	103.	(d)	104.	(d)	105.	(a)	106.	(b)	107.	(d)	108.	(c)	109.	(c)	110.	(a)
111.	(b)	112.	(c)	113.	(b)	114.	(b)	115.	(c)	116.	(c)	117.	(a)	118.	(b)	119.	(b)	120.	(b)
121.	(d)	122.	(c)	123.	(d)	124.	(d)	125.	(a)	126.	(b)	127.	(a)	128.	(d)	129.	(b)	130.	(b)
131.	(a)	132.	(c)	133.	(d)	134.	(c)	135.	(a)	136.	(a)	137.	(d)	138.	(d)	139.	(d)	140.	(b)
141.	(b)	142.	(a)	143.	(a)	144.	(d)	145.	(d)	146.	(c)	147.	(d)	148.	(c)	149.	(b)	150.	(a)
151.	(a)	152.	(d)	153.	(d)	154.	(b)	155.	(d)	156.	(a)	157.	(a)	158.	(d)	159.	(b)	160.	(c)
161.	(a)	162.	(c)	163.	(a)	164.	(a)	165.	(a)	166.	(c)	167.	(a)	168.	(c)	169.	(c)	170.	(d)
171.	(c)	172.	(b)	173.	(a)	174.	(b)	175.	(d)	176.	(b)	177.	(c)	178.	(a)	179.	(a)	180.	(d)

Chapter - 4 : Simple Interest

181.	(a)	182.	(d)	183.	(c)	184.	(c)	185.	(d)	186.	(a)	187.	(c)	188.	(a)	189.	(b)	190.	(b)
191.	(c)	192.	(d)	193.	(c)	194.	(b)	195.	(a)	196.	(d)	197.	(c)	198.	(d)	199.	(b)	200.	(b)
201.	(c)	202.	(c)	203.	(b)	204.	(b)	205.	(d)	206.	(b)	207.	(c)	208.	(b)	209.	(b)	210.	(b)
211.	(a)	212.	(c)	213.	(a)	214.	(a)	215.	(d)	216.	(d)	217.	(d)	218.	(d)	219.	(a)	220.	(b)
221.	(a)	222.	(b)	223.	(d)	224.	(c)	225.	(b)	226.	(c)	227.	(a)	228.	(d)	229.	(b)	230.	(d)
231.	(d)	232.	(d)	233.	(b)	234.	(d)	235.	(c)	236.	(a)	237.	(b)	238.	(a)	239.	(b)	240.	(c)
241.	(a)	242.	(c)	243.	(d)	244.	(a)	245.	(d)	246.	(a)	247.	(b)	248.	(b)	249.	(b)	250.	(c)
251.	(a)	252.	(a)	253.	(c)	254.	(d)	255.	(a)	256.	(b)	257.	(b)	258.	(b)	259.	(c)		

SOLUTIONS

1. (c) S.I. = $\frac{P \times R \times T}{100} = \frac{15000 \times 7 \times 3}{100}$
$= 3150$

2. (b) S.I. = $\frac{P \times R \times T}{100} = \frac{5575 \times 8 \times 4}{100}$
$= ₹1784$

3. (d) SI = $\frac{PRT}{100} = \frac{9900 \times 3 \times 9}{100} = ₹2673$

4. (d) Given,
P = 1250, R = $5\frac{1}{2}\%$, T = 3 year
$\therefore$ SI = $\frac{P \times R \times T}{100} = \frac{1250 \times 11 \times 3}{2 \times 100}$
$= ₹206.25$

5. (a) S.I = $\frac{P \times R \times T}{100} = \frac{5000 \times 12 \times 14}{100 \times 12}$
= Rs.700

6. (c) $\because$ SI = $\frac{P \times R \times T}{100}$
$= \frac{8000 \times 10 \times 6}{100} = ₹4800$

7. (c) $\because$ SI = $\frac{P \times R \times T}{100}$
$\Rightarrow 1800 = \frac{P \times 6 \times 5}{100} \Rightarrow P = ₹\ 6000$

Alternate Method:-
SI = 6% × 5 = 30%
30% = 1800
100% = 6000

8. (d) $\therefore$ SI = $\frac{P \times R \times T}{100}$
$= \frac{5400 \times 4 \times 7}{100} = ₹1512$

Note:- Check the multiple of 9
(54 = 9 × 6)
Only option (d) satisfied.

9. (b) SI = $\frac{P \times R \times T}{100}$
$= \frac{135000 \times 6 \times 27}{100 \times 4} = ₹54675$

Note:- Check the multiple of 9
(27 = 9 × 3)
Only option (b) satisfied.

10. (d) SI = $\frac{P \times R \times T}{100}$
$= \frac{6000 \times 8 \times 21}{100 \times 12} = ₹840$

11. (a) Given,
Principal = Rs.6700, time = 13 months, R = 12%
SI = $\frac{P \times R \times T}{100} = \frac{6700 \times 12 \times 13}{100 \times 12}$
= 67 × 13 = 871

12. (b) Given,
P = 24000, R = 18%, T = $\frac{7}{12}$ month
SI = $\frac{P \times R \times T}{100} = \frac{24000 \times 18 \times 7}{100 \times 12}$
$= ₹2520$

13. (a)

May	June	July	August
10	30	31	2

Total days = 73 days
SI = $\frac{12300 \times 12 \times 73}{100 \times 365}$
$= \frac{123 \times 12}{5} = 295.2 \approx ₹300$

14. (d) $\because$ 10% = ₹72,780
$\therefore$ 100% = ₹7,27,800
$\therefore$ P = ₹7,27,800

15. (a) Total interest = 15 × 5 = 75%
75% ⟶ 69687
100% = 92916

16. (d) SI = 9 × 5 = 45%
$\overset{\times 90}{\curvearrowright}$
45% ⟶ 4050
100% ⟶ $\boxed{9000}$
$\underset{\times 90}{\curvearrowright}$
$\therefore$ Principal = 9000

17. (c) $16\% = \frac{4}{25}$, $P \times \frac{4}{25} \times 5 = 9600$
$\Rightarrow \frac{4}{5}P = 9600 \Rightarrow P = ₹\ 12000$

Alternate Method:-
SI = 16% × 5 = 80%
$\overset{\times 120}{\curvearrowright}$
80 % ⟶ 9600
100 % ⟶ 12000
$\underset{\times 120}{\curvearrowright}$

18. (c) R = 15%, T = 8 years
Then, P = $\frac{SI \times 100}{R \times T} = \frac{23340 \times 100}{15 \times 8}$
$= ₹19450$

19. (c) SI for 6 years = 5% × 6 = 30%
Then,
130% ⟶ 4160
1% ⟶ 32
100% ⟶ 3200.
$\therefore$ Sum = 3200

20. (c) Rate = 9.5% (yearly)
= 19% (for 2 years)
So, $\frac{19 \longrightarrow SI}{100 \longrightarrow P}$
A = P + SI = 100 + 19 = 119 units
⇒ 119 units ⟶ Rs.21420
$\therefore$ 100 units ⟶ Rs.18,000

21. (c) SI = 5 × 4 = 20%
A = P + SI = 120%
120% ⟶ 6600
100% ⟶ 5500
$\therefore$ Sum ⟶ Rs.5500

22. (b) SI = 4 × 5 = 20%
⇒ A = 120% ⟶ 2400
⇒ P = 100% ⟶ 2000
$\therefore$ Present worth = 2000

23. (b) Let the amount be A
$\because$ A = P + $\frac{P \times R \times T}{100}$
$= 4500 + \frac{4500 \times 8 \times 4}{100}$
= 4500 + 1440 = 5940

Alternate Method:
A = 100% + 8 × 4% = 132%
$\therefore A = \frac{4500}{100\%} \times 132\% = 5940$

24. (b) SI = 5.5% × 4 = 22 unit
Amount = 22 + 100 = 122 unit
122 unit = 7503
Sum (100 unit) = $\frac{7503}{122} \times 100 = ₹6150$

25. (b)

March	April	May	June
5	30	31	7

Total time = 73 days
SI = $\frac{P \times R \times T}{100} = 75000 \times \frac{9}{100} \times \frac{73}{365}$
$= ₹1350$
Amount = 75000 + 1350 = ₹76350

26. (d) Given,
Principal = 12000,
Amount = 15000, Time = 5 year
SI = 15000 – 12000 = ₹3000

$$SI = \frac{P \times R \times T}{100}$$

$$\Rightarrow 3000 = \frac{12000 \times R \times 5}{100} \Rightarrow R = 5\%$$

27. (c) Total SI = ₹4100 – ₹2500 = ₹1600

$$\therefore SI = \frac{P \times R \times T}{100}$$

$$\Rightarrow 1600 = \frac{2500 \times 16 \times T}{100}$$

$\Rightarrow T = 4$ yrs

28. (d) SI = 11928 – 8400 = 3528

$$\text{Time} = \frac{SI \times 100}{P \times R} = \frac{3528 \times 100}{8400 \times 7} = 6 \text{ yrs.}$$

29. (c) SI = (1230 – 1040) = 190

$$\text{Time} = \frac{3}{2} \text{ year}$$

$$\Rightarrow \text{Rate} = \frac{190 \times 100 \times 2}{1040 \times 3} = 12\frac{7}{39}\%$$

30. (b) SI = 8928 – 7200 = Rs.1728

$$SI = \frac{P \times R \times T}{100}$$

$$\Rightarrow 1728 = \frac{7200 \times 8 \times T}{100}$$

$$\Rightarrow T = \frac{1728}{72 \times 8} = 3 \text{ yrs.}$$

31. (c) $R = \frac{SI \times 100}{P \times t}$

SI = 2366 – 1456 = 910

$$\therefore R = \frac{910 \times 100}{1456 \times 10} = 6.25\%$$

32. (b) Given,
Principal = 450, S.I. = 81, R = 4.5%

$$SI = \frac{P \times R \times T}{100} \Rightarrow 81 = \frac{450 \times \frac{9}{2} \times T}{100}$$

$$\Rightarrow T = \frac{8100 \times 2}{450 \times 9} = 4 \text{ years}$$

33. (a) $\frac{\text{Amount}}{\text{Principal}} = \frac{9}{5}$, Interest
= 9 – 5 = 4, time = 4 years

$$\therefore SI = \frac{P \times R \times T}{100}$$

$$\Rightarrow 4 = \frac{5 \times r \times 4}{100} \Rightarrow r = 20\%$$

34. (c) ATQ,

$$\frac{\text{Simple Interest}}{\text{Principal}} = \frac{3}{5}$$

$$S.I = \frac{P \times R \times T}{100} \Rightarrow 3 = \frac{5 \times r \times 12}{100}$$

$\Rightarrow r = 5\%$

∴ Rate of interest = 5%

Alternate Method:

$S.I \propto r \times t$

$$\frac{3}{5} = 60\%$$

$$r = \frac{60}{12} = 5\%$$

35. (c) $\underbrace{50000 \qquad 72000}_{\text{Diff.}}$

SI → 22000

$$R = \frac{SI \times 100}{P \times T}$$

$$\text{Rate} = \frac{22000 \times 100}{50000 \times 4} = 11\%$$

36. (c) $SI = \frac{P \times R \times T}{100}$

$$\Rightarrow 45000 = \frac{450000 \times 5 \times T}{100}$$

$\Rightarrow T = 2$ years.

Alternate Method:

SI : P
45000 : 450000
1 : 10

$$\therefore T = \frac{SI \times 100}{P \times R} = \frac{1 \times 100}{10 \times 5} = 2 \text{ years}$$

37. (c) $SI = \frac{P \times R \times T}{100}$

$$\Rightarrow 3240 = \frac{18000 \times R \times 27}{100 \times 12}$$

$\Rightarrow R = 8\%$

∴ Rate of interest = 8%

38. (c) P : SI = 10 : 7

$$\text{S.I for 1 year} = \frac{7}{5} = 1.4$$

$$R\% = \frac{1.4}{10} \times 100 = 14\%$$

39. (c) Given,
Principal = 2000, rate = 6.5%

Time = 14 + 31 + 28 = 73 day

$$\text{Simple interest} = \frac{2000 \times 6.5 \times 73}{100 \times 365}$$

= ₹26

Note:- Here rate is (6.5 = 13 × 0.5) multiple of 13 it means answer is also multiple of 13 only option (c) satisfied.

40. (c) Given,
P = ₹2000, r = 6.5%
t = 15 + 31 + 27 = 73 day

$$SI = \frac{2000 \times 6.5 \times 73}{100 \times 365} = ₹26$$

41. (b) Interest = Amount – principle
= 4900 – 2500 = 2400
ATQ,

$$\Rightarrow 2400 = \frac{2500 \times 12 \times T}{100}$$

$\Rightarrow T = 8$ years

42. (b) Interest = Amount – Principal
= 2250 – 1500 = ₹750

$$T = \frac{750 \times 100}{1500 \times 10} = 5 \text{ years}$$

43. (d) Let, Principal = 3 unit
Amount = 4 unit
SI = 4 – 3 = 1 unit

$$SI = \frac{P \times R \times T}{100} \Rightarrow 1 = \frac{3 \times R \times 3}{100}$$

$$\Rightarrow R = \frac{100}{9} = 11\frac{1}{9}\%$$

Alternate Method:-

$$R = \frac{1}{PT} \times 100 = \frac{1}{3 \times 3} \times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

44. (a) Principal : Amount
5 : 6

$$R = \frac{1}{5} \times 100 = 20\%$$

45. (c) $SI = \frac{P \times R \times T}{100}$

$$\Rightarrow 2672.50 = \frac{5345 \times R \times 10}{100}$$

$$\Rightarrow R = \frac{26725}{5345}\% = 5\%$$

46. (b) SI = 3100 – 2000 = ₹ 1100

$$\because SI = \frac{P \times R \times T}{100}$$

$$\Rightarrow 1100 = \frac{2000 \times 11 \times T}{100}$$

$\Rightarrow T = 5$ years

47. (a) Value increase by 40% = 5 : 7

$$SI = \frac{P \times R \times T}{100} \Rightarrow 2 = 5 \times \frac{6}{100} \times T$$

$$\Rightarrow T = \frac{20}{3} = 6\frac{2}{3} \text{ years.}$$

Alternate Method:-

$S.I \propto r \times t$

$$\frac{40}{6} = 6\frac{2}{3} \text{yrs.}$$

48. (b) We know that,
Amount = 67790
Principal = 25400
SI = 67790 – 25400 = ₹42390

$$SI = \frac{P \times R \times T}{100}$$

$$\Rightarrow 42390 = \frac{25400 \times R \times 9}{100}$$

$$\Rightarrow R = \frac{42390}{254 \times 9} = 18.54\% \text{ (Approx)}$$

49. (d) Let rate of interest be R%
ATQ,

$$\therefore \frac{2500 \times 3 \times R}{100} = \frac{1500 \times 3 \times R}{100} + 360$$

$\Rightarrow (75 - 45)R = 360 \Rightarrow R = 12\%$

50. (c) SI = 5% × 10 = 50%
100% = 2000
150% = 3000
SI = 4000 – 3000 = 1000
R = 5%

$$\text{ATQ, } 1000 = \frac{3000 \times 5 \times T}{100}$$

$$\Rightarrow T = 6\frac{2}{3} \text{ years}$$

$$\text{Total time} = 10 + 6\frac{2}{3} = 16\frac{2}{3} \text{ years}$$

51. (c) We know, $SI = \frac{P \times R \times T}{100}$
ATQ,

$$\frac{500 \times r \times 4}{100} + \frac{700 \times r \times 2}{100} = ₹280$$

$\Rightarrow 34r = ₹280$

$$\Rightarrow r = \frac{280}{34} = 8\frac{4}{17}\%$$

52. (a) ATQ,

$$\begin{tikzcd} \text{5 Years SI} \rightarrow \text{25\% of P} \arrow[d, bend right=60, leftrightarrow, "\times 4"'] \arrow[d, bend left=60, leftrightarrow, "\times 4"] \\ \text{20 Years SI} \rightarrow \text{100\% of P} \end{tikzcd}$$

In 20 years, interest will be equal to principal.

53. (a) P = ₹9500, Amount = ₹11780

SI = A – P = 11780 – 9500 = ₹2280

$\text{Net SI\%} = \frac{2280}{9500} \times 100\% = 24\%$

$\text{Number of years} = \frac{24\%}{8\%} = 3 \text{ year}$

SMART APPROACH:-

Given,

P = ₹9500 & A = ₹11780

P : A = 25 : 31

Here SI = 6

$\text{We know, } 8\% = \frac{2 \rightarrow \text{SI}}{25 \rightarrow \text{P}}$

$\text{Required years} = \frac{6}{2} = 3 \text{year}$

54. (a) SI = 12,300 – 9,840 = 2,460

$\text{SI} = \frac{P \times R \times T}{100}$

$\Rightarrow 2460 = \frac{9840 \times 5 \times T}{100}$

$\Rightarrow T = \frac{24600}{984 \times 5} = \frac{100}{4 \times 5} = 5 \text{ years}$

Alternate Method:-

SI = 12,300 – 9,840 = 2,460

$\text{Net SI \%} = \frac{2460}{9840} \times 100 = 25\%$

$\text{Time} = \frac{25\%}{5\%} = 5 \text{ yrs.}$

55. (b) Given, Amount = ₹18,000

Principal = ₹ 16875

Simple Interest = 18000 – 16875 = 1125

We know that,

$\text{SI} = \frac{P \times R \times T}{100} \Rightarrow 1125 = \frac{16875 \times R \times 20}{100 \times 12}$

$\Rightarrow R = 4\%$

56. (d) $\text{SI} = \frac{P \times R \times T}{100}$

$\Rightarrow 2160 = \frac{9000 \times 8 \times T}{100}$

$\Rightarrow$ Time = 3 years

57. (c) ATQ,

$\Rightarrow \frac{5000 \times 2 \times R}{100} + \frac{8000 \times 3 \times R}{100} = 1700$

$\Rightarrow$ 100 R + 240 R = 1700

$\Rightarrow R = \frac{1700}{340} = 5\%$

58. (c)

$$\begin{tikzcd} \text{5 Years SI} \rightarrow \text{20\% of P} \arrow[d, bend right=60, leftrightarrow, "\times 5"'] \arrow[d, bend left=60, leftrightarrow, "\times 5"] \\ \text{25 Years SI} \rightarrow \text{100\% of P} \end{tikzcd}$$

In 25 yrs. interest will be equal to principal.

59. (b) $\text{SI} = \frac{3}{5} \text{ Principal} \Rightarrow \frac{\text{SI}}{P} = \frac{3}{5}$

$\text{SI} = \frac{P \times R \times T}{100} \Rightarrow 3 = \frac{5 \times 8 \times r}{100}$

$\Rightarrow r = 7\frac{1}{2}\%$

60. (c) Time = 6 year

$\frac{3 \rightarrow \quad \text{SI}}{5 \rightarrow \text{Principal}}$

$\text{S.I of 1 year} = \frac{3}{6} = \frac{1}{2} = 0.5$

$R\% = \frac{0.5}{5} \times 100 = 10\%$

Alternate Method:

Time = 6 year

$\frac{3 \rightarrow \quad \text{SI}}{5 \rightarrow \text{Principal}}$

$\text{SI} = \frac{P \times R \times T}{100}$

$\Rightarrow 3 = \frac{5 \times R \times 6}{100}$

$\Rightarrow R = 10\%$

61. (c) $\frac{4 \longrightarrow \text{S.I}}{5 \longrightarrow \text{Principal}}$

$\text{S.I for 1years} = \frac{4}{8} = \frac{1}{2} = 0.5$

$R\% = \frac{0.5}{5} \times 100 = 10\%$

Alternate Method:-

$\text{S.I} = \frac{P \times R \times T}{100}$

$\Rightarrow 4 = \frac{5 \times 8 \times r\%}{100}$

$\therefore r\% = 10\%$

62. (b) $\frac{\text{Amount}}{\text{Principal}} = \frac{5}{4}$, time = 3 years.

SI = 5 – 4 = 1

$\text{SI} = \frac{P \times R \times T}{100}$

$\Rightarrow 1 = \frac{4 \times r \times 3}{100} \Rightarrow r = 8.33\%$

$\therefore$ Rate of interest = 8.33%

63. (d) Let, P = ₹ 500 then A = ₹900

SI = 900 – 500 = ₹ 400

$\text{SI} = \frac{P \times R \times T}{100} \Rightarrow 400 = \frac{500 \times R \times 4}{100}$

$\Rightarrow R = 20\%$

Alternate Method:-

$R = \frac{I}{PT} \times 100 = \frac{4}{5 \times 4} \times 100 = 20\%$

64. (a) Given,

Simple interest is $\frac{2}{5}$ of principal

We know that,

$\text{SI} = \frac{P \times R \times T}{100} \Rightarrow 2 = \frac{5 \times R \times 5}{100}$

$\Rightarrow R = 8\%$

Alternate Method:-

$R = \frac{I}{PT} \times 100 = \frac{2}{5 \times 5} \times 100 = 8\%$

65. (c) $\frac{A}{P} = \frac{17}{10} \text{ in } \frac{5}{2} \text{ yrs.}$

$\Rightarrow \frac{I}{P} = \frac{7}{10} \text{ in } \frac{5}{2} \text{ yrs.}$

$\text{Rate} = \frac{7}{10} \times \frac{2}{5} \times 100 = 28\%$

SMART APPROACH:-

$R\% = \frac{I}{Pt} \times 100$

$= \frac{7}{2.5 \times 10} \times 100$

$= \frac{7}{25} \times 100 = 28\%$

66. (b) Given, simple interest is $\frac{1}{25}$ of sum and no. of years is equal to rate percentage.

We know that,

$\text{SI} = \frac{P \times R \times T}{100} \Rightarrow 1 = \frac{25 \times t \times t}{100}$

$\Rightarrow t^2 = 4 \Rightarrow t = 2$ years

Alternate Method:-

$\text{S.I} \propto r \times t$

$\frac{1}{25} = 4\% \ (r = t)$

$t^2 = 4$

t = 2 yrs.

67. (b) $P : \text{SI} = 10 : 7 = 10x : 7x$

$\therefore \text{SI} = \frac{P \times R \times T}{100} \Rightarrow 7x = \frac{10x \times R \times 5}{100}$

$\Rightarrow R = 14\%$

68. (b) Given,

$P_1 = 10{,}500,\ R_1 = r\%,\ t = \frac{19}{5} \text{ yr \& } SI_1 = 3325$

$R_2 = 2r\%,\ t_2 = 5y,\ SI_2 = ?$

$SI_2 = \frac{3325 \times p \times 2r \times 5}{p \times r \times \frac{19}{5}}$

= 175 × 10 × 5 = ₹8750

69. (b) SI = 24800 – 10800 = 14000

$\text{SI} = \frac{P \times R \times T}{100}$

$\Rightarrow 14000 = \frac{10800 \times t \times 31}{100 \times 2}$

$\Rightarrow t = 8.36$

$\therefore$ Time required = 8.36 years

70. (a) S.I = Amount – Principal

= 2625 – 1875 = 750

$R = \frac{750 \times 100}{1875 \times 4} = 10\%$

$A = 24000 + \frac{24000 \times 10 \times 9}{100}$

= 24000 + 21600 = 45600

71. (a) Interest in 6 years = 5420 – 3260 = 2160

$\text{Interest in 4 years} = \frac{2160}{6} \times 4 = 1440$

Amount after 4 years = 3260 + 1440 = 4700

72. (a) SI = 96 – 80 = ₹16

$\therefore R = \frac{16 \times 100}{80 \times 2} = 10\%$

Now,

Eff. Rate = (10% × 5) = 50%

$\therefore \text{Amount} = \frac{150}{100} \times 62000 = ₹93000$

73. (c) $SI = \frac{P_1R_1T}{100} + \frac{P_2R_2T}{100}$

$1536 = \frac{1760\times6\times T}{100} + \frac{2240\times9\times T}{100}$

15360 = 1056 T + 2016 T

15360 = 3072 T

$T = \frac{15360}{3072} = 5$ years

74. (d) Total SI after 2 years = 9% of 25000 = 2250

Total amount payable after 2 years = 25000 + 2250 = ₹27250

Alternate Method:-

SI = 4% + 5% = 9%

100% = 25000

$109\% = \frac{25000}{100} \times 109 = ₹27250$

75. (b) SI after 12 years

$= \frac{4400\times10\times12}{100} + \frac{7500\times8\times12}{100}$

= 44 × 120 + 96 × 75

= 5280 + 7200 = 12480

Total Amount = 4400 + 7500 + 12480 = ₹24380

76. (c) Given,

P = 6400, A = 8320

3 Year's SI = 8320 − 6400 = 1920

$\therefore$ 1 year's SI = $\frac{1920}{3} = 640$

Rate % = $\frac{640}{6400} \times 100 = 10\%$

Now,

P = 7200, R = 10%, T = 5

Amount = 7200 × 150% = 10800

77. (a) Rate = $2\frac{6}{7}\% = \frac{20}{7}\%$

Let S.I = P = 1 unit

ATQ,

$SI = \frac{P\times R\times T}{100} \Rightarrow 1 = \frac{1\times20\times Time}{7\times100}$

⇒ Time = 35 years.

78. (b) $SI_1 \to 12 \times 3\frac{1}{2} = 42\%$

diff. 3%

$SI_2 \to 10 \times 4\frac{1}{2} = 45\%$

×120

3 % → 360

100 % → $\boxed{12000}$

×120

79. (a) Principal = 2430

S.I for 3yr. = 1093.50

S.I for 1yr. = $\frac{1093.50}{3} = 364.50$

R% = $\frac{364.50}{2430} \times 100 = 15\%$

Alternate Method:

$S.I = \frac{P\times R\times T}{100}$

$\Rightarrow 1093.50 = \frac{2430\times3\times R}{100}$

⇒ R = 15%

80. (b) Given,

$SI_1 = 3 \times 5\% = 15\%$

$SI_2 = 4 \times 4\% = 16\%$

⇒ Difference = 1%

Hence, 1% of 500 = Rs.5

81. (a) SI = RT%

SI for $1\frac{1}{2}$ yrs. → 15%

SI for 1 yrs. → 12%

3% → 30

1% → 10

100% → 1000

∴ Sum = Rs.1000

82. (d)

×20

8.6% → 172

100% → $\boxed{2000}$

×20

83. (c) Interest ∝ Time × Rate

14(8 − 4) = 14 × 4 = 56 unit

×110

56 unit → 6160

100 unit → $\boxed{11000}$

×110

84. (a) Let sum = ₹ P

A.T.Q,

$\frac{P\times6\times15}{100} - \frac{P\times4\times15}{100} = 4500$

$\Rightarrow \frac{P\times30}{100} = 4500 \Rightarrow P = ₹15000$

Alternate Method:-

$SI_1 = 4 \times 15 = 60\%$

−) 30%

$SI_2 = 6 \times 15 = 90\%$

30% = 4500

100% = 15000

85. (d) 1 year SI = ₹500

$\because SI = \frac{P\times R\times T}{100}$

$\Rightarrow 500 = \frac{P\times10\times1}{100} \Rightarrow P = ₹5000$

Alternate Method:-

SI = 10% (3 − 2) = 10%

×50

10 % → 500

100 % → $\boxed{5000}$

×50

86. (a) $SI_1 = 3 \times 8 = 24\%$

−) 32%

$SI_2 = 7 \times 8 = 56\%$

32% → ₹ 9120

100% → $\frac{9120}{32} \times 100 = 28500$

87. (b) $SI_1 = 6 \times 15 = 90\%$

−) 72%

$SI_2 = 9 \times 18 = 162\%$

×20

72 % → 1440

100 % → 2000

×20

88. (a) Difference of SI

$= \frac{2000\times7\times3}{100} - \frac{3200\times6\times2}{100}$

= (420 − 384) = 36

89. (b) $S.I = \frac{P\times R\times T}{100}$

A.T.Q,

$\frac{8000\times3\times R_1}{100} - \frac{8000\times3\times R_2}{100} = 800$

$\Rightarrow \frac{8000\times3}{100}[R_1 - R_2] = 800$

$\Rightarrow R_1 - R_2 = \frac{10}{3} = 3\frac{1}{3}\%$

90. (b) $SI_1 = 5 \times 7 = 35\%$

−) 8%

$SI_2 = 3 \times 9 = 27\%$

8% = 475

100% = 5937.5

91. (c) In two years −

Total SI = (5 × 2) = 10%

Total due = ₹1100

110% = ₹1100

1% = ₹10

∴ Present worth = 100% = ₹1000

92. (d) Total SI = 3 × 6 + 2 × 14 = 46%

46% → 7590

100% → $\frac{7590}{46} \times 100 = 16500$

93. (d) Total SI

$= \frac{20,000\times10\times3}{100} + \frac{40,000\times15\times3}{100}$

= 6000 + 18000 = ₹ 24000

94. (b) $SI_1 = 4 \times 5 = 20\%$

−) 8%

$SI_2 = 4 \times 7 = 28\%$

Gain = 8% of 90,000 = 7200

95. (b) SI = 13825 − 10500 = 3325

$\frac{SI_1}{SI_2} = \frac{P_1R_1T_1}{P_2R_2T_2}$

$\Rightarrow \frac{3325}{SI_2} = \frac{r\times19}{2r\times5\times5}$

$\Rightarrow 175 \times 50 = SI_2 \Rightarrow SI_2 = 8750$

96. (b) $\frac{I}{P} = \frac{9}{45} = \frac{1}{5} = 20\%$

Rate = x, No. of years = $5x$

$5x \times x = 20$

$\Rightarrow 5x^2 = 20 \Rightarrow x^2 = 4$

$\Rightarrow x = 2\%$

97. (a)

Jan	Feb	March	April	May	June
7	29	31	30	31	18

Total Days = 146 Days

$SI = \frac{78000\times35\times146}{100\times4\times366} = 2722.54$

Amount = 78000 + 2723 (Approx)

= ₹ 80,723

98. (d)

Principal	Amount	SI
1	4	3
1	10	9

3 unit = 12 yrs.

9 unit = 36 yrs.

99. (b)

Principal	Amount	S.I.
1	7	6
1	18	17

6 unit = 14 years
17 unit = 39.67 years

Alternate Method:

Principal and Rate constant
$= SI \propto T$

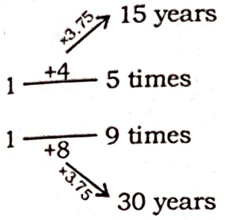
So, $\frac{17}{6} \times 14 = 39.67$

100. (c)

Principal	Amount	S.I.
1	2	1
1	4	3

1 unit = 7 years
3 unit = 21 years

101. (b)



The money becomes 9 times its original value.

102. (a) If amount become 9 times then interest 9 – 1 = 8 time

Principal	Amount	S.I.
1	9	8
1	13	12

8 unit = 20 years
12 unit = 30 years

Alternate Method:

$SI = \frac{P \times R \times T}{100}$

Principal and Rate constant
$= SI \propto T$

SI	$\propto$ T
8	20
12	

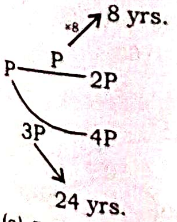
$= \frac{20}{8} \times 12 = 30$

103. (d)

Principal	Amount	S.I.
1	5	4
1	8	7

4 unit = 6%
7 unit = 10.5%

104. (d) $25000 \xrightarrow{\times 4} 100000$



105. (a)

Principal	Amount	S.I.
1	2	1
1	7	6

1 unit = 4 years 6 unit = 24 years
Time = 24 yrs.

106. (b)

Principal	Amount	S.I.
1	2	1
1	5	4

1 unit = 7 years
4 unit = 28 years

107. (d) If money will be 3 times then SI will be 2 times

ATQ,

$SI = \frac{P \times R \times T}{100} \Rightarrow 2 = \frac{1 \times R \times 16}{100}$

$\Rightarrow$ Rate = 12.5%

Alternate Method:-

$R = \frac{n-1}{T} \times 100 = \frac{3-1}{16} \times 100 = \frac{25}{2}$

= 12.5%

108. (c) $\because$ $S.I. = \frac{P \times R \times T}{100} \Rightarrow 2 = \frac{1 \times R \times 15}{100}$

$\Rightarrow R = \frac{200}{15} = \frac{40}{3} = 13\frac{1}{3}\%$

109. (c) Let principal = x

$\therefore$ $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 6x = \frac{x \times R \times 16}{100} \Rightarrow R = 37.5\%$

Alternate Method:-

$R = \frac{n-1}{T} \times 100$

$= \frac{7-1}{16} \times 100 = \frac{75}{2} = 37.5\%$

110. (a) $R = \frac{n-1}{T} \times 100$

$= \frac{3-1}{25} \times 100 = 8\%$

111. (b) We know, $R\% = \frac{n-1}{t} \times 100$

ATQ,

$R_1\% = \frac{8}{21} \times 100\% \approx 38\%$

$R_2 = \frac{11}{25} \times 100\% = 44\%$

% Increase in R% = 44% – 38% = 6%

112. (c) $R\% = \frac{5-1}{18} \times 100 = \frac{200}{9} \approx 22\%$

113. (b)

P	A
100	400

SI = 300

$SI = \frac{P \times R \times T}{100} \Rightarrow 300 = \frac{100 \times R \times 12}{100}$

$\Rightarrow R = 25\%$

SMART APPROACH:-

$Rate = \frac{(4-1)}{12} \times 100\% = 25\%$

114. (b) P : A = 1 : 3

SI = 3 – 1 = 2

$2 = \frac{1 \times R \times 9}{100} \Rightarrow R\% = \frac{200}{9} = 22\frac{2}{9}\%$

Alternate Method:-

$R\% = \frac{3-1}{9} \times 100 = \frac{200}{9} = 22\frac{2}{9}\%$

115. (c) $R\% = \frac{3-1}{36} \times 100 = \frac{50}{9} = 5.55\%$

$(\frac{1}{9} = 11.11\%)$

116. (c) ATQ,

SI = 8 – 7 = 1

Now,

$1 = \frac{7 \times R \times 2}{100}$

$\Rightarrow R = \frac{50}{7} = 7\frac{1}{7}\%$

Alternate Method:-

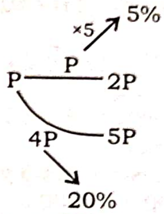
Principal	Amount
7	8

1

In 1 year = $\frac{1}{7}$

In 2 year = $\frac{1}{14} = 7\frac{1}{7}\%$

117. (a)



Rate = 20%

118. (b) $R\% = \frac{4-1}{T} \times 100 \Rightarrow 50\% = \frac{300}{T}$

$\Rightarrow$ T = 6 yrs.

For more than 4 times time will be greater than 6 yrs.

So, time = 7 yrs.

119. (b) $\frac{P \times (R+6) \times 4}{100} - \frac{P \times R \times 4}{100} = 600$

$\Rightarrow \frac{R+6-R}{100} = \frac{600}{4P} \Rightarrow 6 = \frac{600 \times 25}{P}$

$\Rightarrow$ P = 2500

$\therefore$ 2.5P = 2500 × 2.5 = ₹ 6250

Alternate Method:-

SI = 6 × 4% = 24

24% → 600
100% → 2500

2.5P = 2500 × 2.5 = ₹6250

120. (b) If Simple interest is 7% higher, then simple Interest for 6 year = 7% × 6 = 42%

ATQ,

42% → 1512
1% → 36
100% → 3600

$\therefore$ The principal amount = Rs. 3600

121. (d) R%, Time = 3 yrs.

$R^1 = R + 5\%$

$\Rightarrow$ For 3 yrs. rate of interest is 15% more.

15% → 600
100% → 4000

122. (c) R = 25%

T = 6 yrs., I = P + 360

ATQ, $P + 360 = \frac{P \times 25 \times 6}{100}$

$\Rightarrow 3P = 2P + 720 \Rightarrow P = 720$

Alternate Method:-

$R = 25\% = \frac{1}{4}$

	P	:	A
For one year	4	:	5
For 6 years	24	:	30

∵ ATQ,

(30 – 24) unit = (4) unit + 360

(6) unit = (4) unit + 360

(2) unit = 360

Principal (4 unit) = ₹720

SMART APPROACH:-

Let principal amount = 100%

∴ Total interest = 6 × 25%
= 150%

150% – 100% → 360

∴ 100% → 720

123.(d) Rate difference

$= 17\frac{1}{2}\% - 11\% = 6\frac{1}{2}\%$

$= 1071.2 \times \frac{2}{13} \times 100 = ₹16480$

Now, $SI = \frac{16480 \times 10 \times 5}{100} = ₹\,8240$

124.(d) Effective rate% = (8 + 12 + 16 + 20 + 24)% = 80%

∴ Total interest earned in 5 years
= 80% of 10,000 = ₹ 8000

125.(a) ATQ, (5 + 5.5 + 6 + 6.5)% = 23%

×200

23 % → 4600

100 % → 20,000

×200

126.(b) ATQ,

×30

4.5 % → 135

5 % → 150

×30

Additional interest = 150 – 135 = 15

127.(a) SI of 3 yrs. = 1040 – 800 = ₹240

$\therefore SI = \frac{P \times R \times T}{100} \Rightarrow 240 = \frac{800 \times R \times 3}{100}$

⇒ R = 10%

Now,

⇒ $R^1 = (10 + 3) = 13\%$

$SI = \frac{800 \times 13 \times 3}{100} = 312$

∴ Amount = 800 + 312 = ₹1112

SMART APPROACH:-

Interest rate is increased by 3% for 3 yrs.

SI = 3 × 3% = 9%

⇒ 9% of 800 = 72

Amount = 1040 + 72 = Rs.1112

128.(d) Let, principal = 5x, SI = x

Time = t, Rate = 5t

$SI = \frac{P \times R \times t}{100} \Rightarrow x = \frac{5x \times t \times 5t}{100}$

⇒ t = 2 yrs.

Rate = 2 × 5 = 10%

New, rate = (10 + 3)% = 13%

$SI = \frac{5600 \times 13 \times 6}{100} = Rs.4368$

Note:- To avoid last step calculation, use digital sum method or check the multiple of 7.

56 × 78 = 2 × 6 = 3

Option (d): 4368

digital sum of 4368 = 3.

129.(b) Interest ∝ R × T

11% higher rate means total increment in interest = 11 × 4 = 44%

×30

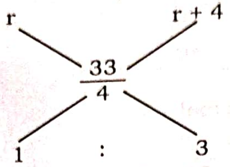
44% → 1320

100% → $\boxed{3000}$

×30

130.(b) Overall interest% = $\frac{4125}{25000 \times 2} \times$

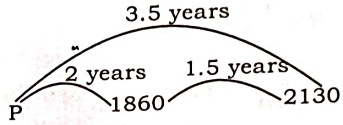
$100\% = \frac{33}{4}\%$



$\Rightarrow \frac{33}{4} = \frac{r + 3r + 12}{4} \Rightarrow 5.25 = r$

∴ 2nd Sum was invested at 5.25 + 4
= 9.25%

131. (a)


3.5 years
2 years
1.5 years
P
1860
2130

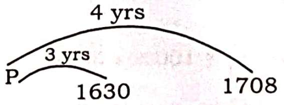
Interest in 1.5 years
= 2130 – 1860 = 270

Interest in 2 years = 360

Principal = 1860 – 360 = 1500

$Rate = \frac{180 \times 100}{1500 \times 1} = 12\%$

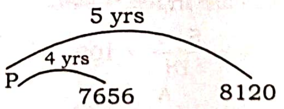
132.(c)


4 yrs
3 yrs
P
1630
1708

1 Year's SI =1708 – 1630 = 78

P = 1630 – 78 × 3 = ₹1396

133.(d)


5 yrs
4 yrs
P
7656
8120

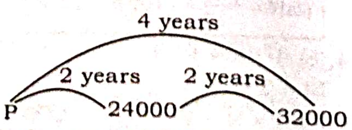
Interest for 1 year = 8120 – 7656
= ₹464

Interest for 4 years = 464 × 4
= 1856

∴ Principal = 7656 – 1856 = 5800

$\therefore R = \frac{464 \times 100}{5800} = 8\%$

134.(c)

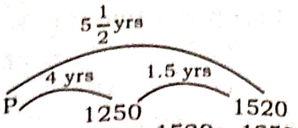

4 years
2 years
2 years
P
24000
32000

SI in 2 years = 32000 – 24000 = 8000

Principal = 24000 – 8000 = Rs.16000

$Rate = \frac{8000 \times 100}{16000 \times 2} = 25\%$

135.(a)


5 1/2 yrs
4 yrs
1.5 yrs
P
1250
1520

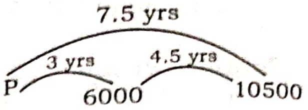
SI in 1.5 years = 1520 – 1250 = ₹270

SI in 1 year = ₹ 180

Principal = 1250 – 4 × 180
= 1250 – 720 = ₹ 530

$Rate\ of\ interest = \frac{180}{530} \times 100 = 33.96\%$

136.(a)


7.5 yrs
3 yrs
4.5 yrs
P
6000
10500

∴ SI of 4.5 years = 10,500 – 6000
= 4500

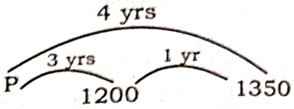
∴ SI of 3 years = ₹ 3000

∴ P = 6000 – 3000 = ₹3000

$\therefore SI = \frac{P \times R \times T}{100}$

$\Rightarrow 3000 = \frac{3000 \times R \times 3}{100} \Rightarrow R = 33\frac{1}{3}\%$

137.(d)

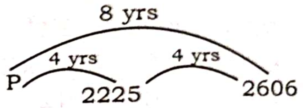

4 yrs
3 yrs
1 yr
P
1200
1350

1 Year's SI = ₹1350 – ₹1200 = ₹150

3 Year's SI = ₹150 × 3 = ₹450

∴ Sum = ₹1200 – ₹450 = ₹750

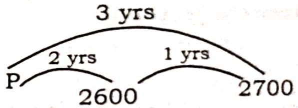
138.(d)


8 yrs
4 yrs
4 yrs
P
2225
2606

SI in 4 years = ₹381

Principal = 2225 – 381 = ₹1844

139.(d)

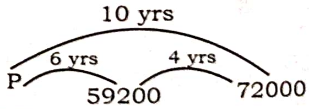

3 yrs
2 yrs
1 yrs
P
2600
2700

1 years SI = 100

2 years SI = 200

Principal = 2600 – 200 = ₹2400

140.(b)


10 yrs
6 yrs
4 yrs
P
59200
72000

A.T.Q

Interest of 4 years = 72000 – 59200 = 12800

⇒ Interest of 1 year = 3200

Interest for 6 years = 3200 × 6 = 19200

∴ P = 59200 – 19200 = ₹40,000

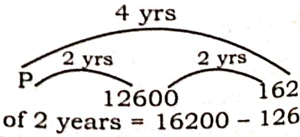
$\therefore R\% = \frac{3200 \times 100}{40000} = 8\%$

∴ Now, (R + 2)% = 10%

Interest = 76,000 – 40,000 = 36,000

$Time = \frac{36,000 \times 100}{40,000 \times 10} = 9\ yrs$

141.(b)


4 yrs
2 yrs
2 yrs
P
12600
16200

SI of 2 years = 16200 – 12600
= ₹3600

Principal = 12600 – 3600 = ₹ 9000

$SI = \frac{P \times R \times T}{100} \Rightarrow 3600 = \frac{9000 \times R \times 2}{100}$

⇒ R = 20%

142.(a)

11 yrs

7 yrs 4 yrs

P 14522 18906

4 Year's SI = 18906 – 14522 = ₹4384
1 Year's SI = ₹1096
Principal = 14522 – 1096 × 7 = ₹6850

143.(a)

4% 6%

4.7%

Invest → 1.3 0.7
13 : 7

ATQ,
20 units → 2,00,000
13 units → 1,30,000
7 units → 70,000

144.(d)

	Ist Part	:	IInd Part
Principal →	x	:	$4000 - x$
Rate →	8%	:	10%

SI = 8% of 4000 = Rs.320
Remaining SI = Rs.352 – Rs.320
= Rs.32 which is due to diff. of rate.
(10 – 8)% = 32
2% = 32
100% = 1600
∴ Sum lent at 10% = Rs.1600

Alternate Method:

$$\text{Overall rate\%} = \frac{352}{4000} \times 100$$

= 8.8%

8% 10%

8.8%

1.2 : 0.8
3 : 2
(3 + 2) = 5 unit = 4000
2 unit = 1600

145.(d) Effective rate = $\frac{720}{8000} \times 100 = 9\%$

⇒ 9% for 2 years and 4.5% for 1 year

5% 4%

4.5%

0.5% 0.5%

1 : 1 = 2
↓ ↓ ↓ ×4000
4000 4000 8000

146.(c) I. In 1st case SI :- $13900 \times \frac{28}{100} = 3892$

II. In 2nd case SI :- $13900 \times \frac{22}{100} = 3058$

3892 3058

3508

450 384
834 unit → 13900
384 unit → 6400

Alternate Method:

Total amount

$$\boxed{₹13{,}900} \xrightarrow{\times 11\%} ₹1529$$

Now,
2yr. → SI = 3508
1yr. → SI = 1754
−1529

B A
11% 11% + 3% → 225

$$100\% \to \frac{225}{3} \times 100 = 7500$$

Investment made by A = ₹7500
Investment made by B
= 13900 – 7500 = ₹6400

147.(d) Rate = $\frac{4500}{20000} \times 100 = 22.5\%$

C B
Rate → 25% 21%

22.5

1.5 2.5
3 : 5
(5 + 3) → 8 unit → 20,000
3 unit → 7500

Alternate Method:

Total amount

$$\boxed{₹20{,}000} \xrightarrow{\times 21\%} ₹4200$$

Now,
1yr. → SI = ₹4500
−4200

C B
21% 21% + 4% → 300
×25↓ ↓×25
100% → 7500

A borrows money from B = 7500

148.(c) ATQ,

$$x = \frac{2800 \times 10 \times 3}{100} = 840$$

Again,

$$1736 = \frac{6200 \times 14 \times y}{100} \Rightarrow y = 2$$

$$\therefore \frac{x}{y} = \frac{840}{2} = 420$$

149.(b) Net % = $\frac{2650}{30000} \times 100\% = \frac{53}{6}\%$

8% 9 %

$\frac{53}{6}\%$

$\frac{1}{6}\%$: $\frac{5}{6}\%$
1 : 5
∵ (1 + 5) unit = 30000
1 unit = 5000
Amount lent on 8% = ₹5000

150.(a) Total SI = $\frac{5200}{50000} \times 100 = 10.4\%$

8% 12%

10.4%

1.6 2.4
2 : 3

5 unit → 50000

3 unit → $\frac{50000}{5} \times 3 = ₹30000$

Alternate Method:-

A : B
8% : 8% + 4%
If he deposits whole money at 8%

Interest = $50000 \times \frac{8}{100} = 4000$

Extra = 5200 – 4000 = 1200
4% of B = 1200 ⇒ B = ₹30000

151.(a) ATQ,
Let sum at 7% be ₹ 'A'

$$210 = \frac{A \times 7 \times 1}{100} + \frac{(3500 - A) \times 5}{100}$$

⇒ 7A – 5A + 17500 = 21000
⇒ 2A = 3500 ⇒ A = ₹1750

Alternate Method:-

$$\text{Overall Rate\%} = \frac{210}{3500} \times 100 = 6\%$$

7 5

6

1 : 1

$$\therefore \text{Sum at 7\%} = \frac{3500}{2} = ₹1750$$

152.(d) SI for 1 year = ₹ 840
If rate = 8%

Then, SI = $\frac{10000 \times 8 \times 1}{100} = ₹800$

Difference in SI = 840 – 800 = ₹40
This difference in SI is due to difference in rate of interest
(10 – 8)% = ₹ 40
100% = ₹ 2000
Amount invested in scheme A
= 10000 – 2000 = ₹8000

Alternate Method:-

$$\text{Overall interest\%} = \frac{840}{10000} \times 100$$

= 8.4%

8% 10%

8.4%

1.6 0.4
4 1

Amount invested in scheme A

$$= \frac{10000}{5} \times 4 = ₹8000$$

153.(d) Overall rate% = $\frac{960}{5000} \times 100$

= 19.2%

16% 24%

19.2%

4.8 : 3.2
3 : 2
∵ (3 + 2) units = 5000
∴ 2 unit = 2000

154.(b) Overall interest in one year

$= \frac{1}{2} \times \frac{2400}{10,000} \times 100\% = 12\%$

Sum 1 Sum 2
10% 15%
12%
3 : 2
×2000
5 unit → 10,000
2 unit → 4,000
×2000

155.(d)

9 years

Rate → 8%	11%	16%
Time → 2 years	3 years	4 years
S.I → 16%	33%	64%

Total SI = (16 + 33 + 64)% = 113%

$\therefore P = \frac{21400}{113\%} \times 100\% = 18938$

156.(a)

12 yrs

Time → 4 yrs	6 yrs	2 yrs	
Rate → 5%	8%	12%	
SI → 20%	48%	24%	= 92%

92% = 9016
100% = ₹9800

157. (a)

7 yrs

Time → 3 yrs	2 yrs	2 yrs	
Rate → 5%	8%	10%	
SI → 15%	16%	20%	= 51%

51% = 12750
100% = ₹25000

158.(d)

18 yrs

Time → 8 yrs	6 yrs	4 yrs	
Rate → 7.25%	8.5%	6.5%	
SI → 58%	51%	26%	= 135%

135% = 35100
100% = 26000

159.(b)

7 yrs

Time → 2 yrs	3 yrs	2 yrs	
Rate → 6%	10%	12%	
SI → 12%	30%	24%	= 66%

66% → 12771

$100\% \rightarrow \frac{12771}{66} \times 100 = 19350$ ₹

160.(c)

Sum → 18000

P → 7000 6000 5000
R → ↓×5% ↓×6% ↓×x%
S.I → 350 + 360 + $50x = 1160$
$\Rightarrow 50x = 1160 - 710$

$\Rightarrow x = \frac{450}{50} = 9\%$

161.(a) ATQ,

$\text{Interest} = \frac{5000\times2\times10}{100} + \frac{5000\times3\times12}{100}$

= 1000 + 1800 = 2800

∴ Simple interest for 5 years = 2800

Alternate Method:

Total SI = 2 × 10% + 3 × 12%
= 56%

$\therefore SI = \frac{5000}{100} \times 56 = 2800$

162.(c) $SI = \frac{5000\times5\times5}{100} = ₹1250$

Amount = 5000 + 1250 = ₹6250

Again,

$SI = \frac{6250\times5\times3}{100} = ₹937.50$

Total SI = 1250 + 937.50 = ₹2187.50

Alternate Method:-

SI = 5% × 5 = 25%
100% = 5000
125% = 6250
Now,
SI = 5% × 3 = 15%
100% = 6250
115% = 7187.50
SI earned in 8 yrs. = 7187.50 – 5000
= ₹2187.50

163.(a) $SI_1 = SI_2 = SI_3$

$\Rightarrow \frac{a\times3\times1}{100} = \frac{b\times4\times1}{100} = \frac{c\times6\times1}{100}$

⇒ 3a = 4b = 6c

⇒ a : b : c = 4 : 3 : 2

∴ Amount invested at 6%

$= \frac{9000\times2}{9} = ₹2000$

SMART APPROACH:-

r → 3 : 4 : 6
p → 24 : 18 : 12
4 : 3 : 2

Amount invested at 6%

$= \frac{9000}{9} \times 2 = \text{Rs.}2000$

Note:- If amount is same then $r \propto \frac{1}{p}$

164.(a) $SI = \frac{P\times R\times T}{100}$

ATQ,

$\frac{7200\times3\times16}{100} = \frac{9600\times x\times4}{100}$

∴ $x = 9\%$

165. (a) ATQ,

$\frac{5000\times t\times4}{100} = 8000 \times \frac{5}{2} \times \frac{8}{100}$

⇒ 20t = 20 × 8

⇒ t = 8 years

166. (c) We know,

$SI = \frac{P\times R\times T}{100}$

$\frac{8000\times5\times4}{100} = \frac{10000\times4\times t}{100}$

⇒ t = 4 years

167.(a) ATQ,

$\frac{800\times6\times5.5}{100} = \frac{600\times4\times T}{100}$

⇒ T = 11

168.(c) ATQ,

Simple interest is equal in both case,

$\Rightarrow \frac{7000\times2\times R}{100} = \frac{5000\times14\times5}{100}$

⇒ R = 25%

169.(c)

	Son		Daughter		Wife
SI ⇒	$3x$	=	$4y$	=	$5z$
⇒	$\frac{x}{20}$	=	$\frac{y}{15}$	=	$\frac{z}{12}$

Total (47 unit) → 105750

$\text{Wife (12 unit)} \rightarrow \frac{105750}{47} \times 12$

= 27000

170. (d) Total SI = $SI_1 + SI_2$

$2800 = \frac{12000\times r\times4}{100\times12} + \frac{18000\times2r\times8}{100\times12}$

⇒ 2800 = 40r + 240r ⇒ r = 10%

171. (c) $\frac{P\times r\times3}{100} + \frac{2P\times(r-2)\times5}{100} = 13,600$ ......(i)

$13,600 = \frac{P\times r\times34}{100\times3}$ .....(ii)

from eqn. (i) and (ii)

r(9 + 30) – 60 = 34r ⇒ r = 12%

Now, $13600 = \frac{P\times12\times34}{100\times3}$

⇒ P = ₹10,000

172.(b) Difference

$= \frac{8000\times12\times4}{100} - \frac{5000\times15\times3}{100}$

= 3840 – 2250 = Rs.1590

173. (a) Let, certain sum = 500x

$SI = \frac{3}{5} \times x = \frac{3x}{5}$, R = 10%

$T = \frac{SI\times100}{P\times R} = \frac{3x\times100}{x\times5\times10} = 6$ yrs.

$SI = \frac{16000\times14\times6}{100} = \text{Rs.}13440$

174. (b) Let, Principal amount = x

rate of interest = r%

ATQ,

$x \times r\% - x \times 5\% = x \times 8\%$

⇒ r = 13%

175. (d) Amount = Rs.9810, R = 9%

⇒ for 6 months (R) = 4.5%

ATQ,

109 unit → 9810

$104.5 \text{ unit} \rightarrow \frac{9810}{109} \times 104.5$

$= \frac{981\times1045}{109} = 9405$

Used unit digit:- '5'

Only option (d) has unit digit = 5

⇒ (d) Rs.9405

176. (b) Amount after 2 years

$= \frac{10000 \times 15 \times 2}{100} + 10000 = 13000$

Now amount becomes principal for next 2 years.

Amount after 4 years

$= 13000 + \frac{13000 \times 15 \times 2}{100}$

$= 13000 + 3900 = 16900$

Alternate Method:

P = 10000

SI after 2 years = 15 × 2 = 30%

Now

Amount after 4 years

$= 10000 \times \frac{13}{10} \times \frac{13}{10} = 16900$

177. (c) Rate of Interest for customer = 6%

earning of bank:

$= \frac{30000}{300000} \times 100 = 10\%$

Diff. = 10 − 6 = 4%

∴ Earnings of bank = 4% of

$6000000 = \frac{4}{100} \times 6000000$

= Rs. 240000

178. (a) $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 972000 = \frac{1200000 \times R \times T}{100}$

∵ R = T

$\Rightarrow R^2 = 81 \Rightarrow R = 9\%$

179. (a) $SI = \frac{P \times R \times T}{100}$

$\therefore SI = \frac{12000 \times 9 \times 1}{100} + \frac{12000 \times 10 \times 1}{100}$

= 1080 + 1200 = 2280

∴ Amount = 12000 + 2280

= Rs.14280

Alternate Method:

SI = 1 × 9% + 1 × 10% = 19%

$\therefore A = \frac{12000}{100\%} \times 119\% = Rs.14280$

180. (d) Amount = 36000 +

$\frac{8 \times 1}{100} \times 36000 + \frac{6 \times 1}{100} \times 36000$

= 36000 + 2880 + 2160 = 41040

Alternate Method:

SI = 8% + 6% = 14%

$\therefore \text{Amount} = \frac{36000}{100\%} \times 114\%$

= 41040

181. (a) $\frac{1}{5} = 20\%$

No. of year ⇒ x, Rate ⇒ $3.2x$

$3.2x^2 = 20\%$

$x^2 = \frac{200}{32} = \frac{25}{4}$ (Time) $x = \frac{5}{2}$

(Rate) $\Rightarrow 3.2x = \frac{5}{2} \times 3.2 = 8\%$

New rate = 8% + 4%↑ = 12%

$SI = \frac{7500 \times 12 \times 4}{100} = 75 \times 48 = 3600$

182. (d) Rate of Interest in 5 years

SI = 6 × 5 = 30%

Amount = 130%

Simple interest in 8 years = 8 × 9 = 72%

∵ 130% = 113880, 72% = 63072

183. (c) A.T.Q,

$SI = \frac{24000 \times 1 \times 4}{100} + \frac{24000 \times 1 \times 5}{100}$

= 960 + 1200 = 2160

Amount = 24000 + 2160 = ₹ 26160

Alternate Method:-

SI = 4% + 5% = 9%

100% = 24000

$109\% = \frac{24000}{100} \times 109 = 26160$

184. (c) SI = 9800 − 8000 = ₹ 1800

T = 3 years

$\therefore SI = \frac{P \times R \times T}{100}$

$\Rightarrow 1800 = \frac{8000 \times R \times 3}{100} \Rightarrow R = \frac{15}{2}\%$

ATQ,

$R = \frac{15}{2} \times 2 = 15\%$, T = 4 years

$SI = \frac{8000 \times 15 \times 4}{100} = ₹4800$

Amount = 8000 + 4800 = ₹ 12800

Alternate Method:-

3 yrs. interest = 9800 − 8000 − 1800

4 yrs. interest $= \frac{1800}{3} \times 4 = 2400$

At double rate, 4 yrs. interest = 4800

∴ Amount = 8000 + 4800 = 12800

185. (d) $SI = \frac{P}{4}$, $R = 4T \Rightarrow T = \frac{R}{4}$

$\frac{P}{4} = \frac{P \times R \times R}{100 \times 4} \Rightarrow R = 10\%$

If, R = 10 + 2 = 12%, T = 6 years,

P = 3600

$SI = \frac{3600 \times 12 \times 6}{100} = ₹2592$

Alternate Method:-

∴ ₹3600 is multiple of 9 then SI. is also multiple of 9, the (d) option is multiple of 9.

186. (a) R = 8%

∵ count in 6 monthly

Then, R = 4%

Effective rate $= 4 + 4 + \frac{4 \times 4}{100} = 8.16\%$

187. (c) New rate $= \frac{3}{4} \times 10\% = \frac{15}{2}\%$

$SI = \frac{5}{8}$th of principal

$\Rightarrow \frac{5}{8} = \frac{1 \times \frac{15}{2} \times t}{100} \Rightarrow t = \frac{25}{3} = 8\frac{1}{3}$ years

188. (a) Let, Time = T, $R = \frac{T}{4}$

⇒ T = 4R

We know, $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 11664 = \frac{32400 \times R \times 4R}{100}$

$\Rightarrow R^2 = \frac{11664}{324 \times 4} = \frac{2916}{324} = 9$

⇒ R = 3%

189. (b) Rate difference = 8.5 − 6 = 2.5%

Profit per year $= \frac{20000 \times 2.5 \times 1}{100}$

= ₹500

190. (b) Interest for first 2 yrs. $= 2 \times \frac{10}{100} \times$

15600 = 1560 × 2 = 3120

Principal for 3rd yr. = 15600 + 3120

= 18720

Principal for next 2 yrs. = 18720

$\Rightarrow \text{Interest} = 2 \times \frac{18720}{100} \times 10$

= 1872 × 2 = 3744

∴ Total interest after 4 yrs.

= 3120 + 3744 = 6864

Alternate Method:

Per year rate = 10%

Per 2 years Rate $= 20\% = \frac{1}{5}$

P : A

For 2 years → 5 : 6

For 4 years → 25 : 36

$\underbrace{25 : 36}_{SI}$

$\downarrow \times 624$ 11 ⟶ 6864

15600

191. (c) Given that Interest

$= \frac{1}{8}$ principal

Time $= \frac{Rate}{2}$ years

$\Rightarrow \frac{1}{8}P = \frac{P \times R}{100} \times \frac{R}{2} \Rightarrow R = 5\%$

Now, Principal = 15000, Time

= 8 yrs, Rate = 5%

$S.I = \frac{15000 \times 8 \times 5}{100} = Rs.6000$

192. (d) Let Amount = 1 then simple interest $= \frac{1}{4}$

The rate of interest = R

Then, time $= \frac{R}{4}$ years

Now, $\frac{1}{4} = \frac{\left[1 \times R \times \left(\frac{R}{4}\right)\right]}{100}$

$\Rightarrow \frac{1}{4} = \frac{R^2}{400} \Rightarrow R^2 = 100$

$\Rightarrow R = \sqrt{100} = 10\%$

The new rate of interest = 10 + 2 = 12%

Total interest for 3 years = 3 × 12 = 36%

$\therefore SI = \left(\frac{36}{100}\right) \times 5000 = 1800$

SMART APPROACH:-

$R = \frac{I}{Pt} \times 100$

$R = \frac{\frac{1}{4}}{\frac{R}{4}} \times 100\% \Rightarrow R = 10\%$

New R = 10% + 2% = 12%

∴ S.I in 3 years = 36% of 5000 = Rs. 1800

193. (c) Given,

Total = 300 pieces

If he defers payment for a year he get only 200 pieces.

So, $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 100 = \frac{200 \times r \times 1}{100} \Rightarrow r = 50\%$

194. (b) 10% t = 6% (t + 2)

$\Rightarrow 5t = 3(t + 2) \Rightarrow 5t = 3t + 6$

$\Rightarrow t = 3$ years

Now,

130% → 1105

$\therefore 100\% = \frac{1105}{130} \times 100 = 850$

P = ₹850

195. (a) $\frac{14395.2}{(100 + 9.25 \times 5.4)\%} \times (8.6 \times 4.5)\%$

$= \frac{14395.2}{149.95} \times (8.6 \times 4.5) = 3715.20$

196. (d) SI = 8 × 8% = 64%

(100 + 64)% = 820

1% = 5

(100 + 20 × 10)% = 300%

$\Rightarrow 5 \times 300 =$ Rs.1500

Amount = Rs.1500

Alternate Method:

$SI_1 = 8 \times 8\% = 64\%$

$SI_2 = 10 \times 20\% = 200\%$

$\therefore A_2 = \frac{820}{164\%} \times 300\% =$ Rs.1500

197. (c) Interest ∝ Rate × Time

= [(20 × 19.2) − (15 × 11.2)] unit

= 2920

[Both time are in month so do not need to convert it into year divide at last by 12]

$\frac{216}{12}$ unit → 2920

100 unit → 16,200 (Approx)

198. (d) Let P = 100%

SI = RT% = 12.5 × 6 = 75%

ATQ,

100% − 75% = 13500

25% = 13500

SI → 75% = 13,500 ×3 = ₹40,500

199. (b) $\frac{P \times 11 \times 4}{100} - \frac{P \times 6 \times 4}{100} = 7500$

$\Rightarrow \frac{P \times 20}{100} = ₹7500 \Rightarrow P = ₹37500$

Alternate Method:-

$SI_1 = 11 \times 4\% = 44\%$

$-$ 20%

$SI_2 = 6 \times 4\% = 24\%$

×5 (20% = 7500) ×5

100% = 37500

200. (b) Given,

Difference b/w SI = ₹162

A.T.Q,

$3000 \times \frac{5}{100} \times t - 2460 \times \frac{5}{100} \times t = 162$

$\Rightarrow \frac{5}{100} \times t \times 540 = ₹162$

$\Rightarrow t = 6$ years

201. (c) $SI_1 = 3 \times 14 = 42\%$

$-$ 28%

$SI_2 = 5 \times 14 = 70\%$

28% = 4200

100% = 15000

202. (c) Sum = 3000 (given)

R% = Time

$SI = \frac{P \times R \times T}{100} \Rightarrow 3000 = \frac{3000 \times R \times R}{100}$

$\Rightarrow R^2 = 100 \Rightarrow R = 10\%$

Alternate Method:-

S.I ∝ r × t

(r = t)

$r^2 = 100\% \Rightarrow r = 10\%$

203. (b) Let, Rate of interest for 3 yrs at Bachat scheme be 'R'

∴ Rate of interest for Siksha scheme R + 2 for 3 yrs

The extra 2% for 3 yrs fetched her ₹540 more

6% = 540

100% = 9000

204. (b) 3% extra rate yields ₹ 585 more S.I

$\Rightarrow (3 \times 2\frac{1}{2})\% \rightarrow 585 \Rightarrow \frac{15}{2}\% \rightarrow 585$

$100\% = \frac{585}{15} \times 2 \times 100 = ₹\ 7800$

$\therefore$ Required $SI = \frac{7800 \times 14}{100} \times \frac{14}{3}$

= ₹5096

205. (d) Let, P be the sum invested in scheme A.

$\Rightarrow \frac{P \times 8 \times 5}{100} + \frac{4P \times 5 \times 7}{100} = 1620$

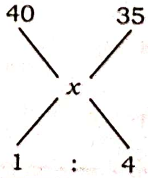
$\Rightarrow \frac{40}{100}P + \frac{140}{100}P = 1620$

$\Rightarrow 180P = 162000 \Rightarrow P = 900$

∴ Amount invested in B = 4 × 900 = Rs.3600

Alternate Method:-

Let, x be overall SI%



ATQ,

$\Rightarrow \frac{40 - x}{x - 35} = \frac{4}{1} \Rightarrow x = 36\%$

Hence,

$\Rightarrow \frac{36}{100}(P + 4P) = 1620$

$\Rightarrow P = \frac{1620}{36 \times 5} \times 100 = 900$

Hence, 4P = ₹3600

206. (b) ATQ,

$\frac{K \times \sqrt{r} \times n^2}{100} = \frac{L \times r^{3/2} \times n^3}{100}$

$\Rightarrow K \times r^{1/2} = L \times r^{3/2} \times n$

$\Rightarrow \frac{K}{L} = \frac{r^{3/2} \times n}{r^{1/2}} \Rightarrow \frac{K}{L} = \frac{rn}{1} = rn:1$

207. (c) $\frac{\text{Amount}}{\text{Principal}} = \frac{1.25}{1} = \frac{5}{4}$

$\Rightarrow \frac{I}{P} = \frac{1}{4}$

3 yrs. → $\frac{1}{4}$, 7 yrs. → $\frac{7}{12}$

After 7 yrs, $\frac{\text{Amount}}{\text{Principal}} = \frac{19}{12}$

$\Rightarrow \frac{76,0000}{x} = \frac{19}{12} \Rightarrow x = ₹\ 4,80,000$

SMART APPROACH:-

$R\% = \frac{n-1}{t} \times 100 = \frac{0.25}{3} \times 100 = \frac{25}{3}\%$

$\therefore 760,000 = P + P \times \frac{25}{3} \times \frac{7}{100}$

$\Rightarrow 760,000 = \frac{19P}{12} \Rightarrow P =$ Rs. 480,000

208. (b) Let two parts = x, y

$x \times \frac{20}{3} \times \frac{21}{5} = 2 \times y \times 4 \times \frac{11}{4}$

$\Rightarrow 14x = 11y$

$\Rightarrow \frac{x}{y} = \frac{11}{14}$ $-$ 3 unit

$\overset{\times 200}{25 \text{ unit} \rightarrow 5000}$

$\underset{\times 200}{3 \text{ unit} \rightarrow 600}$

209. (b) ATQ,

$\frac{P \times x \times 3}{100} \times 7 = \frac{P \times 3x \times (3 + y)}{100}$

$\Rightarrow 7 = 3 + y \Rightarrow y = 4$

210. (b) Let, the first part of the amount = x

Second part of the amount = $48500 - x$

ATQ,

$\Rightarrow \frac{x \times 15 \times 5}{(48500 - x) \times 10 \times 3} = \frac{5}{3}$

$\Rightarrow 3x = 2 \times 48500 - 2x$

$\Rightarrow 5x = 2 \times 48500$

$\Rightarrow x = \frac{2 \times 48500}{5} \Rightarrow x = 19400$

The second part = 48500 − 19400 = 29100

211. (a) $S.I = \frac{P \times R \times T}{100}$

ATQ, $\frac{P \times 21 \times 8}{P \times 21 \times 21} = \frac{8}{21} = 8 : 21$

212. (c) $I \times \frac{21}{5} \times \frac{20}{3} = 2 \times II \times \frac{11}{4} \times 4$

$\Rightarrow \frac{II}{I} = \frac{14}{11}$

213. (a)

1st part	2nd part
4P × 4 × 8%	5P × 5 × 8%
128P	200P

72P% → 4680

P = 6500

Total sum lent = 9P

= 6500 × 9 = ₹58500

214. (a) Given,

Sum = 4000

T = 4 years

SI = (4960 – 4000) = 960

$R = \frac{960 \times 100}{4000 \times 4} = 6\%$

$$\begin{tikzcd} SI & R \\ 960 \arrow[d, bend right, "\times 1.5"'] & 6\% \arrow[d, bend left, "\times 1.5"] \\ 1440 & 9 \end{tikzcd}$$

Amount = (4000 + 1440) = 5440

215. (d) Amount = 3, SI = 3 – 1 = 2

$2 = \frac{1 \times 10 \times T}{100} \Rightarrow T = 20$ years

(I) $SI = \frac{1 \times 20 \times 20}{100} = 4$, A = 5 times

(II) $SI = \frac{1 \times 30 \times 20}{100} = 6$, A = 7 times

Both statement are correct

Alternate Method:-

$R\% = \frac{3-1}{T} \times 100 \Rightarrow 10\% = \frac{200}{T}$

$\Rightarrow T = 20$ yrs.

(I) $R\% = \frac{5-1}{T} \times 100 \Rightarrow 20\% = \frac{400}{T}$

$\Rightarrow T = 20$ yrs.

(II) $R\% = \frac{7-1}{T} \times 100 \Rightarrow 30\% = \frac{600}{T}$

$\Rightarrow T = 20$ yrs.

Both (I) and (II) are true

216. (d) $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 2550 = \frac{8500 \times R \times 6}{100} \Rightarrow R = 5\%$

New rate = 1.8 × 5% = 9%

Amount = $8500 + \frac{8500 \times 9 \times 5}{100}$

= ₹12325

217. (d) ATQ,

$\frac{29000 \times 3 \times R}{100} + \frac{45000 \times 5 \times R}{100}$

= 62400

870R + 2250R = 62400

3120R = 62400

R = 20%

218. (d) $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 2{,}000 = R\left[\frac{10{,}000 \times 2}{100} + \frac{5000 \times 4}{100}\right]$

$\Rightarrow R[200 + 200] = 2000 \Rightarrow R = 5\%$

219. (a) Let, rate of interest = r%

Total SI = $\frac{500 \times 3 \times r}{100} + \frac{650 \times 5 \times r}{100} + \frac{1250 \times 7 \times r}{100} = 15r + \frac{65}{2}r + \frac{175}{2}r$

= 135r

ATQ, $135r = 1620 \Rightarrow r = \frac{1620}{135} = 12\%$

220. (b) $\because SI = \frac{P \times R \times T}{100}$

ATQ,

$4 = \frac{1 \times R \times R}{100} \Rightarrow R^2 = 400 \Rightarrow R = 20\%$

221. (a) Total interest for five year = 1600

for 1 year = $\frac{1600}{5}$ = Rs.320

8% = Rs.320

100% = Rs.4000

Raju = Rs.3000

Ravi = 4000 – 3000 = Rs.1000

Alternate method:-

S.I for Raju = $\frac{3000 \times 8 \times 5}{100} = 1200$

Remaining S.I for Ravi

= 1600 – 1200 = 400

$$\begin{tikzcd} & S.I & \\ Ravi \arrow[r] & 8 \times 5\% = 40\% \arrow[r] \arrow[d, "\times 2.5"] & 400 \arrow[d, "\times 2.5"] \\ & 100\% & \boxed{1000} \end{tikzcd}$$

222. (b) Given, Total interest on 4500

= 5 × 4 = 20%

Total interest on 5500 = 8 × 4 = 32%

Amount on lower rate		Amount on higher rate
4500 × 120%	:	5500 × 132%
90	:	121

$\therefore$ Required% = $\frac{90}{121} \times 100 \approx 74\%$

223. (d) 100% = 30000

15% = 4500

Required % = $\frac{4500}{18000} \times 100 = 25\%$

224. (c) L.C.M of 2, 5 = 10

If we assume sum = 10

Principal →	5	2	3
Rate →	20%	25%	10%
SI →	100%	50%	30%

1 yrs SI = $\frac{360}{2} = 180$

$\because$ 180% = 180

Sum (10) = $\frac{180}{180\%} \times 10 = 10 \times 100 = ₹1000$

225. (b) 130% A = 140% of B

$\Rightarrow 13 \times 9100 = 14 \times B \Rightarrow B = 8450$

$\therefore \frac{90}{100} \times B = \frac{90}{100} \times 8450 = ₹7605$

Note:- (90% → 9 × 10%) it means answer will multiple of 9.

Only option (b) satisfied.

226. (c) We know,

Installment = $\frac{A \times 100}{100t + \frac{rt(t-1)}{2}}$

$= \frac{26160 \times 100}{400 + 24 \times \frac{3}{2}} = \frac{2616000}{436}$

I = Rs.6000

Alternate Method:

Due debt = 26160

Value of each installment = 100 unit

Due debt = 100 + 106 + 112 + 118

= 436 unit = 26160

100 unit = Rs.6000

227. (a) Installment = $\frac{A \times 100}{100t + \frac{Rt(t-1)}{2}}$

$= \frac{942900}{300 + 36.75\frac{(2)}{2}}$

$= \frac{942900}{336.75} = \frac{1257200}{449} = ₹2800$

Alternate Method:-

Amount = 100% + (100 + 12.25)% + (100 + 12.25 + 12.25)% = 336.75%

336.75% = 9429

100% = ₹2800

228. (d) Let each installment = 100

Amount due = 100 + 105 + 110 + 115 + 120 + 125 = 675

ATQ,

100 → ₹ 800

$\therefore 675 \rightarrow \frac{800 \times 675}{100} = ₹5400$

229. (b) Total amount of debt = 100% + 105% + 110% + 115% + 120%

= 550%

100% = 200 (given)

550% = 1100

230. (d) Debt = 3658

Let, installment = 100 unit

Then due debt = (100 + 112 + 124 + 136)

= 472 unit

Now,

472 unit = 3658

100 unit = $\frac{3658}{472} \times 100 = 775$

231. (d) Due debt = 40376

Value of each installment = 100 unit

Due debt = 100 + 102 + 104 + 106

= 412 unit → 40376

100 unit = 9800

232. (d) Due debt = 1380

Value of each installment = 100 unit

Due debt = 100 + 110 + 120 + 130

= 460 unit = 1380

100 unit = 300

233. (b) Due debt = 15600
Value of each installment = 100 unit
Due debt = 100 + 104 + 108 = 312
= 312 unit = 15600
100 unit = 5000

234. (d) 3500 × 4 = 14000
Interest = (16310 – 14000) = 2310
Let, y = rate of interest
$IV \to 3y$
$III \to 2y$
$II \to y$
$I \to 0$
6y% × 3500 = 2310
y = 11%

235. (c) Due debt = ₹181500
Let the value of each installment = 100 unit
Due debt = 100 + 110 + 120 = 330 unit
Value of each installment

$$= \frac{181500}{330} \times 100 = ₹55000$$

236. (a) Due debt = ₹35,455
Let the value of each installment = 100 unit
Due debt = 100 + 112 + 124 = 336 unit
Value of each installment

$$= \frac{35455}{336} \times 100 = ₹10552$$

237. (b) Due debt = ₹15750
Let the value of each Installment = 100 units
Due debt = 100 + 105 + 110 = 315
Value of each Installment

$$= \frac{15750}{315} \times 100 = ₹5000$$

238. (a) $\text{Installment} = \dfrac{100 \times A}{100t + \dfrac{Rt(t-1)}{2}}$

$$\text{Amount} = 2000 + \frac{2000 \times 5 \times 3}{100}$$

$$= 2000 + 300 = 2300$$

$$\therefore \text{Installment} = \frac{2300 \times 100}{300 + 15}$$

$$= \frac{230000}{315} = 730\frac{10}{63}$$

Alternate Method:-
Amount payable after 3 years

$$= 2000 + \frac{2000 \times 5 \times 3}{100} = 2300$$

Due debt = 2300
Value of each installment = 100 unit
Due debt = 100 + 105 + 110

$$\text{Installment (100 unit)} = \frac{2300}{315} \times 100$$

$$= ₹\ 730\frac{10}{63}$$

239. (b) Let Rate = R%

$$1 = \left[\frac{10 \times R \times 1}{12 \times 100} + \frac{9 \times R \times 1}{12 \times 100} + \ldots\ldots + \frac{1 \times R \times 1}{12 \times 100}\right]$$

$$1 = \frac{R}{12 \times 100}[10 + 9 + 8 + \ldots.. + 1]$$

$$1 = \frac{R}{1200} \times 55 \Rightarrow R = \frac{240}{11} = 21\frac{9}{11}\%$$

240. (c) $\because \text{SI} = \dfrac{P \times R \times T}{100}$

$$\text{SI} = \frac{20000 \times 8 \times 2}{100} = ₹\ 3200$$

∴ Amount = 20000 + 3200 = ₹23200

Alternate Method:-
SI = 2 × 8% = 16%

$$100\% \xrightarrow{\times 200} 20{,}000$$

$$116\% \xrightarrow[\times 200]{} \boxed{23{,}200}$$

241. (a) $r = \dfrac{12}{12} \times 5 = 5\%,\ t = \dfrac{15}{5} = 3$

Due debt = 100 + 105 + 110 = 315

$$\text{Installment} = \frac{94500}{315} \times 100$$

= ₹30,000

242. (c) Cash payment = ₹19000
∴ Remaining amount
= 39000 – 19000 = ₹20000
Total amount paid as installment
= 5 × 4200 = ₹21000
∴ Total interest = 21000 – 20,000
= ₹1000
Let, rate of interest be R

$$\therefore 1000 = \frac{(20000 + 15800 + 11600 + 7400 + 3200) \times R \times 1}{12 \times 100}$$

$$\Rightarrow 1000 = \frac{58000}{12 \times 100}R$$

$$\Rightarrow R = \frac{600}{29}\% = 20\frac{20}{29}\%$$

243. (d) Principal = Rs.422092
R = 20%

$$\text{SI} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

Principal after 1 yr.
= 422092 – 21679 = Rs.400413

$$\text{Amount} = \frac{422092 \times 20 \times 1}{100} + \frac{400413 \times 120 \times 1}{100}$$

= 84418.4 + 480495.6 = 564914

244. (a) Principal after first year
= 141545 – 25490 = 116055

$$\text{SI} = \frac{P \times R \times T}{100}$$

$$\text{Amount} = 1{,}41{,}545 \times \frac{11}{100} + 116055 \times \frac{111}{100}$$

= 15569.95 + 128,821.05
= 1,44,391

245. (d) Principal = 623305
Rate = 10%
Time = 1 years

$$\text{SI} = \frac{623305 \times 10 \times 1}{100} = 62330.5$$

After Ist year pranav return Rs.16390 of principal so principal for 2nd year
= 623305 – 16390 = 606915

$$\text{SI of IInd year} = \frac{606915 \times 10 \times 1}{100}$$

= 60691.5
Amount = 62330.5 + 606915 + 60691.5 = Rs.729937

246. (a) Principal = Rs.192208.
R = 15%

$$\text{SI} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

Principal after 1 year
= 192208 – 20196 = 172012
Amount pay end of second years

$$= \frac{192208 \times 15 \times 1}{100} + \frac{172012 \times 115 \times 1}{100}$$

= 226645
Note:- Using digital sum,
6 × 4 + 4 × 7 = 6 + 1 = 7
Option(a):- 226645
Digital sum of 226645 = 7

247. (b) Principal = Rs.598397,
R = 20%

$$\text{SI} = \frac{P \times R \times T}{100}$$

Principal after 1 year
= 598397 – 24284 = 574113

$$\text{Amount} = \frac{598397 \times 20 \times 1}{100} + \frac{574113 \times 120 \times 1}{100} = 808615$$

Note:- Using digital sum,
5 × 2 + 3 × 3 = 1 + 9 = 1
option (b) 808615
Digital sum of 808615 = 1

248. (b) Total amount = Rs.975
First installment = Rs.100
Time = n
2nd installment = 100 – 5 = Rs.95
So, the installment is in A.P
Now, using A.P sum formula
a = 100, n = ?
$a_n = 975,\ d = -5$

$$S_n = \frac{n}{2}[2a + (n-1)d] \ldots\ldots.(i)$$

$$\Rightarrow 975 = \frac{n}{2}[200 + (n-1) \times (-5)]$$

$$\Rightarrow 1950 = 200n - 5n^2 + 5n$$

$$\Rightarrow 1950 = 205n - 5n^2$$

$$\Rightarrow n^2 - 41n + 390 = 0$$

$$\Rightarrow n^2 - 26n - 15n + 390 = 0$$

$$\Rightarrow (n-15)(n-26) = 0$$

$$\Rightarrow n = 15$$

∴ n = 26 is not satisfied in equation (i)
∴ Required no. of month = 15.

249.(b) Principal after first year
= 348020 – 15090 = 332930
ATQ,

$$\text{Money paid} = 3{,}48{,}020 \times \frac{8}{100} + 332930 \times \frac{108}{100}$$

= 27,841.6 + 359,564.4 = 387,406

Note:-
To avoid calculation use digital sum method

$$3{,}48{,}020 \times \frac{8}{100} + 332930 \times \frac{108}{100}$$

= 8 × 8 + 2 × 9 = 1 + 9
= 1 (digital sum)

250.(c) Principal = Rs.335180
R = 13%

$$SI = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

Principal after 1 yr.
= 335180 – 23060 = Rs.312120

$$\text{Amount} = \frac{335180 \times 13 \times 1}{100} + \frac{312120 \times 113 \times 1}{100} = 396269$$

Using digital sum method,
2 × 4 + 0 = 8
option (c) = 396269
Digital sum of 396269 = 8

251.(a) Interest = 250 + 310 – 550
= Rs. 10
Principal = 550 - 250 = 300

$$\text{Rate} = \frac{SI \times 100}{\text{Principal} \times \text{Time}}$$

$$\therefore R = \frac{10 \times 100 \times 12}{300 \times 1} = 40\%$$

252.(a) Interest = 25000 + 4 × 4000 – 40000 = Rs.1000
Remaining principal = 15000 + 11000 + 7000 + 3000 = 36000

$$\text{Rate} = \frac{SI \times 100}{\text{Principal} \times \text{time}}$$

$$= \frac{1000 \times 100}{36000 \times \frac{1}{12}} = \frac{100}{3} = 33\frac{1}{3}\% \sim 33\%$$

253. (c) Interest = 1340 + 1205 – 2540
= Rs.5

$$\text{Rate} = \frac{SI \times 100}{\text{Principal} \times \text{time}}$$

$$= \frac{5 \times 100}{1200 \times \frac{1}{12}} = \frac{500 \times 12}{1200} = 5\%$$

254.(d) Remaining amount = 2500 – 520
= 1980
Amount for installment = 1980 +

$$1980 \times 4 \times \frac{25}{1200} = 1980 + 165 = 2145$$

$$\therefore \text{Installment} = \frac{A \times 100}{100 \times T + \frac{RT(T-1)}{2}}$$

$$= \frac{214500}{400 + \frac{4}{2} \times \frac{25}{12} \times (3)}$$

$$= \frac{214500 \times 2}{825} = \frac{429000}{825} = ₹520$$

Alternate Method:-

$$\begin{array}{ll} 100 & \\ 100 & 75 \\ 100 & 50 \\ 100 & 25 \\ \hline 400 & \frac{150}{12} = 12.5 \end{array}$$

= 400 + 12.5 = 412.5
⇒ 412.5 → 2145

$$\text{Monthly installment} = \frac{2145}{412.5} \times 100$$

= 520

255.(a) Total paid interest after 11 month

$$= 500000 \times \frac{3}{200} + 460000 \times \frac{3}{200} + 420000 \times \ldots\ldots$$

$$= \frac{10000 \times 3}{200} [50 + 46 + 42 + 38 + \ldots\ldots + 10] = 150 \times \left(\frac{11}{2} \times 60\right)$$

= 150 × 330 = 49500
Value of motorgages = Last term + Interest = 100000 + 49500
= 149500 ≈ 150000

Alternate Method:-
This method gives approx answer
Total installment amount
= 11 × 40,000 = 4,40,000
SI = 5,00,000 × 18% = 90,000
Value of motorgages
= 5,00,000 – 4,40,000 + 90,000
= 1,50,000

256. (b) Total Amount paid in installments
= 20 × 25000 = ₹ 5,00,000
Also, Rate = 10%
⇒ Amount on which interest is applied

$$= \frac{500000}{11} \times 10 = 4{,}54{,}545.455$$

∴ Down payment
= 6,50,000 – 454545.455 ≈ 1,95,455

257. (b) Principal = ₹ 1,00,000 , Rate = 10%

	Principal	Interest	Down payment
I^{st} year	1,00,000	10,000	10,000
IInd year	90,000	9,000	20,000
IIIrd year	70,000	7,000	30,000
IVth year	40,000	4,000	40,000

⇒ 5th year = 10,000 + 9,000 + 7,000 + 4,000 = ₹ 30,000

Alternate Method:

Total Principal = ₹100000

Paid in installment = 10000 + 20000 + 30000 + 40000 = ₹100000

Now in 5 th year he only pay the interest

$$= (100000 + 90000 + 70000 + 40000) \times \frac{10}{100} = 300000 \times \frac{1}{10} = ₹30000$$

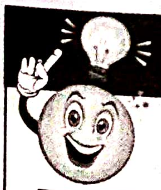
258. (b) Given P = 600 – 300 = 300

$$S.I = \frac{300 \times r \times 2}{12 \times 100} \Rightarrow 60 = \frac{300 \times r \times 2}{12 \times 100}$$

$\therefore r = 120\%$

259. (c) We have,
Due debt = ₹10192
Let the value of each installment
= 100 units
Due debt = 100 + 110 + 120 = 330
Value of each installment

$$= \frac{10192}{330} \times 100 = ₹3088.48$$



SPEED BOOSTER HACKS

◆ Some special results you should remember ◆

$(2)^1 = 2$	$(2)^6 = 64$	$(3)^1 = 3$	$(3)^6 = 729$	$(4)^1 = 4$	$(5)^1 = 5$
$(2)^2 = 4$	$(2)^7 = 128$	$(3)^2 = 9$	$(6)^1 = 6$	$(4)^2 = 16$	$(5)^2 = 25$
$(2)^3 = 8$	$(2)^8 = 256$	$(3)^3 = 27$	$(6)^2 = 36$	$(4)^3 = 64$	$(5)^3 = 125$
$(2)^4 = 16$	$(2)^9 = 512$	$(3)^4 = 81$	$(6)^3 = 216$	$(4)^4 = 256$	$(5)^4 = 625$
$(2)^5 = 32$	$(2)^{10} = 1024$	$(3)^5 = 243$	$(6)^4 = 1296$	$(4)^5 = 1024$	$(5)^5 = 3125$

05
Chapter

COMPOUND INTEREST

◆ TYPE – I ◆
BASED ON 2 CYCLE

1. What is the compound interest on ₹62,500 for 2 years at 8% per annum compounded yearly?
SSC CHSL 03/08/2023 (Shift-03)
(a) ₹10,500 (b) ₹10,300
(c) ₹10,400 (d) ₹10,600

2. Kalyan invested a sum of ₹12,000 for two years at the rate of 5% and 10% respectively. What is the compound interest (in ₹) at the end of two years?
SSC CHSL 07/08/2023 (Shift-03)
(a) ₹1920 (b) ₹1860
(c) ₹1900 (d) ₹1880

3. If the interest rate is 2.5% per annum for the first year and 2% per annum for the second year, find the compound interest of ₹6,000 in two years.
SSC CHSL-II 10/01/2024 (Shift-01)
(a) ₹240 (b) ₹270
(c) ₹273 (d) ₹135

4. If interest be compounded half-yearly, then find the compound interest on ₹8,000 at 20% p.a. for 1 year.
SSC CPO 05/10/2023 (Shift-01)
(a) ₹1685 (b) ₹1680
(c) ₹1675 (d) ₹1690

5. What is the present value of the sum if the interest compounded at the rate of 18% per annum for two years is ₹981?
SSC CHSL 03/08/2023 Shift-04
(a) ₹2800 (b) ₹2500
(c) ₹3600 (d) ₹2400

6. What will be the present value of ₹13,230 due two years hence, when the interest is compounded at the rate of 5% per annum?
SSC CHSL 07/08/2023 (Shift-01)
(a) ₹13,000 (b) ₹10,500
(c) ₹11,500 (d) ₹12,000

7. Compound interest (compounding annually) on a sum for 2 years is ₹4180. If rate of interest is 20 percent per annum, then what is the sum?
SSC CHSL 09/03/2023 (Shift-04)
(a) ₹8800 (b) ₹9800
(c) ₹9500 (d) ₹8500

8. Priya borrowed a certain sum of money at 12% per annum. If she paid a sum of ₹10176 as interest compounded annually at the end of 2 years, then what was the amount she borrowed?
SSC MTS 04/05/2023 (Shift-03)
(a) ₹40000 (b) ₹20000
(c) ₹50000 (d) ₹30000

9. A sum of ₹20000 is lent for 1 year at the rate of 16 percent annual compound interest. If the interest is compounded half-yearly, how much interest will be received?
SSC MTS 08/05/2023 (Shift-03)
(a) ₹3180 (b) ₹3396
(c) ₹3224 (d) ₹3328

10. What is the difference between the compound interest on ₹6,400 for 1 year at 5% per annum C.I. compounded yearly and half-yearly?
SSC CHSL 10/08/2023 (Shift-03)
(a) ₹8 (b) ₹9
(c) ₹4 (d) ₹7

11. On a certain sum of money lent out of 16% per annum, the difference between the compound interest for 1 year, payable half-yearly, and the simple interest for 1 year is ₹60. The sum is?
SSC CPO 11/11/2022 (Shift-02)
(a) ₹937.5 (b) ₹9,000
(c) ₹9,365 (d) ₹9,375

12. The difference in interests earned on ₹1,50,000 at 8% rate of interest per annum in a year when the interest is compounded half-yearly and annually, respectively, is ₹.....
SSC MTS 01/09/2023 (Shift-03)
(a) 240 (b) 120
(c) 420 (d) 360

13. The compound interest (compounding annually) on a certain sum at the rate of 8 percent per annum for two years is ₹6656. What would be the simple interest on the same sum at the same rate of interest for two years?
SSC CGL TIER-II (08/08/2022)
(a) ₹6224 (b) ₹6336
(c) ₹5600 (d) ₹6400

14. Rahul invested equal sums of money at compound interest under two schemes A and B. Under scheme A, the interest rate was 10% per annum and under scheme B, the interest rate was 12% p.a. The compound interest after two years on the sum invested in scheme A was ₹ 1,050. How much is the interest earned under scheme B after two years, if the interest is compounded annually in both schemes?
SSC CGL TIER-II 18/11/2020
(a) ₹ 1270 (b) ₹ 1372
(c) ₹ 1722 (d) ₹ 1272

◆ TYPE – II ◆
BASED ON 3 & 4 CYCLE

15. What is the compound interest on ₹25,000 for 3 years at 10% per annum compounded annually?
SSC CHSL 04/08/2023 (Shift-02)
(a) ₹8,125 (b) ₹8,000
(c) ₹8,200 (d) ₹8,275

16. ₹21,000 is lent at compound interest of 10% p.a. for three years. Find the amount?
SSC Phase-X 05/08/2022 (Shift-03)
(a) ₹27,000 (b) ₹27,951
(c) ₹6,951 (d) ₹28,951

17. The compound interest on a sum of ₹5,500 at 15% p.a. for 2 years, when the interest compounded 8 monthly is:
SSC CGL TIER-II 15/11/2020
(a) ₹1880 (b) ₹1,820.50
(c) ₹1,773.75 (d) ₹1,850

18. Find the compound interest on ₹10,000 for $1\frac{1}{2}$ years at 20% per annum, interest payable half-yearly.
SSC CHSL 08/08/2023 Shift-01
(a) ₹3315 (b) ₹3310
(c) ₹3305 (d) ₹3320

19. Find the amount if a sum of ₹7500 is invested on compound interest at 8% p.a. for 1.5 years when the interest is compounded half yearly.
SSC CPO 10/11/2022 (Shift-02)
(a) ₹8,436.48 (b) ₹8,736.48
(c) ₹8,657.48 (d) ₹8,564.48

20. What would be the compound interest on ₹15,750 at 20% per annum, in two years, if the interest is compounded half yearly?
SSC CGL 03/12/2022 (Shift-03)
(a) ₹5,213.25 (b) ₹3,307.5
(c) ₹7,305.975 (d) ₹7,309.575

21. If C is the compound interest on ₹10,000 for one year at 4% per annum when compounded quarterly, then which one of the following is correct?
UPSC CDS-II 2022
(a) C < ₹100
(b) ₹100 < C < ₹200
(c) ₹200 < C < ₹400
(d) C > ₹400

22. What sum at the rate of $2\frac{1}{2}\%$ become ₹9826 in 18 months if the interest is compounded half yearly.
SSC CHSL 14/08/2023 (Shift-04)
(a) ₹9,392.00 (b) ₹9,444.00
(c) ₹9,512.45 (d) ₹9,466.55

23. What is the compound interest on a sum of ₹25,000 after three years at a rate of 12 percent per annum interest compounded yearly?

SSC CPO 03/10/2023 (Shift-03)

(a) ₹10,123.20 (b) ₹9,824.00
(c) ₹9,956.86 (d) ₹10,520.00

24. A sum of money was invested at 10% interest per year, compounded half-yearly, for 18 months. If the amount payable on maturity was ₹64,827, what was the sum invested?

SSC CPO 04/10/2023 (Shift-01)

(a) ₹55,600 (b) ₹56,500
(c) ₹56,800 (d) ₹56,000

25. What sum of money invested at 8% per annum in $1\frac{1}{2}$ years, compounded half-yearly, shall become ₹17,576?

SSC MTS 06/09/2023 (Shift-03)

(a) ₹15,525 (b) ₹15,625
(c) ₹15,000 (d) ₹16,500

26. A person borrowed ₹8000 on compound interest at the rate of 20 percent per annum. If the interest is compounded half yearly, then what will be the amount to be paid after 1.5 years?

SSC CHSL 16/03/2023 (Shift-02)

(a) ₹10648 (b) ₹11488
(c) ₹10825 (d) ₹9865

27. A sum of ₹30000 is lent at compound interest (compounded annually) for 3 years. If the rate of interest is 10 percent for the first year, 20 percent for the second year and 30 percent for the third year, then what will be the total compound interest?

SSC MTS 14/06/2023 (Shift-02)

(a) ₹21480 (b) ₹19270
(c) ₹20560 (d) ₹22580

28. Vipul and Manish invested the sum of ₹15000 and ₹20000 at the rate of 20 percent p.a and 30 percent p.a. respectively on compound interest (compounding annually). If time period is 3 years for both, then what will be the total compound interest earned by Vipul and Manish?

SSC CGL TIER-II 08/08/2022

(a) ₹34860 (b) ₹32480
(c) ₹29460 (d) ₹31688

29. What is the difference between the compound interest, compounded half yearly on ₹72,000 for 1.5 years at 10% per annum and its simple interest for 3 years at 5% per annum?

SSC MTS 06/09/2023 (Shift-01)

(a) ₹549 (b) ₹449
(c) ₹559 (d) ₹540

30. The amount of a certain sum in 2 years at 20% p.a. is ₹7776, interest compounded yearly. What will be the amount of the same sum in $1\frac{1}{2}$ years at the same rate of interest, compounded half yearly? (Nearest to a ₹)

ICAR 29/07/2022 (Shift- 04)

(a) ₹7,187 (b) ₹7,178
(c) ₹7,285 (d) ₹7,085

31. A sum of ₹15,000 was lent for 3 years at the rate of 4%, 5%, 6% per annum, respectively, at compound interest for the first year, second year and third year compounded annually. Find the compound interest for 3 years.

SSC MTS 12/09/2023 (Shift-03)

(a) ₹2,335.60 (b) ₹2,338.80
(c) ₹2,362.80 (d) ₹2,388.60

32. Find the compound interest (in ₹) on a sum of ₹7,500 for 4 years if the rate of interest is 20% per annum for the first two years and 10% per annum for the next two years. (The interest is compounded annually.)

SSC CHSL 10/08/2021 (Shift-02)

(a) ₹6,558 (b) ₹5,658
(c) ₹5,586 (d) ₹5,568

33. If an increase of 40% is observed on an amount in 4 years at simple interest, what will be the compound interest on ₹80,000 after 4 years at the same rate of interest?

SSC CHSL TIER-II (18/11/2024)

(a) ₹17,128 (b) ₹39,724
(c) ₹29,728 (d) ₹37,128

34. Find the amount (integral value only) if a sum of ₹6,500 is being borrowed at 10% interest per annum for 2 years if interest is compounded half-yearly.

SSC CPO 05/10/2023 (Shift-02)

(a) ₹7,900 (b) ₹8,150
(c) ₹8,250 (d) ₹7,650

35. Mohan invested ₹5,000 in a bank which offered interest at the rate of 10% per year compounded semi-annually. How much amount will he get after 2 years? [Give your answer correct to the nearest integer value.]

SSC MTS 07/07/2022 (Shift-01)

(a) ₹6512 (b) ₹6320
(c) ₹6250 (d) ₹6078

36. A certain sum is deposited for 4 years at a rate of 10% per annum on compound interest compounded annually. The difference between the interest at the end of 2 years and that at the end of 4 years is ₹5082. Find the sum (in ₹)

SSC CGL 11/04/2022 (Shift-01)

(a) 20000 (b) 25500
(c) 50820 (d) 10164

37. A borrowed a sum of ₹1,60,000 from B at 10% per annum simple interest. At the same time, he lent the same sum to C at the same rate on compound interest, compounded semi-annually for 2 years. Find the profit (in ₹) earned by A in the whole transaction.

SSC CGL 17/08/2021 (Shift-02)

(a) 4280 (b) 4281
(c) 2481 (d) 2840

38. Jonathan had borrowed a sum of money 3 years ago at 10% interest per annum compounded annually for a 5-year period, with the amount to be paid at the end of the period being ₹1,61,051. However, there is no pre-payment penalty and Jonathan has received some bonus payment now, with which he has decided to clear his debt. How much does Jonathan have to pay now to clear his debt?

SSC CPO 03/10/2023 (Shift-01)

(a) ₹1,33,100 (b) ₹1,33,200
(c) ₹1,33,000 (d) ₹1,32,900

39. Peter invested a certain sum of money in a scheme paying 10% simple interest per annum, while Rachel invested half of the sum that Peter invested in a scheme paying 10% interest per annum compounded annually. Also, while Peter invested for 2 years, Rachel invested for 3 years. If the difference in the interest earned by Peter and Rachel was ₹897, what was the sum that Rachel had invested?

SSC CPO 04/10/2023 (Shift-02)

(a) ₹12,900 (b) ₹13,000
(c) ₹13,100 (d) ₹12,960

◆ TYPE – III ◆
WHEN TIME IS GIVEN IN FRACTION

40. A certain amount of money was lent for a period of 1 year 9 months at a rate of 10% per annum compounded annually. If the compound interest is ₹1460, find the amount of money lent?

SSC CHSL 02/08/2023 (Shift-01)

(a) ₹8200 (b) ₹7500
(c) ₹6000 (d) ₹8000

41. What is the compound interest (in ₹) on a sum of ₹8192 for $1\frac{1}{4}$ years at 15% per annum, if interest is compounded 5-monthly?

SSC CGL 13/08/2021 (Shift-01)

(a) 1,640 (b) 1,740
(c) 1,634 (d) 1,735

42. What is the compound interest on a sum of ₹10,000 at 14% p.a. for $2\frac{5}{7}$ years where the interest is compounded yearly? (nearest to ₹1)

SSC CGL 06/06/2019 (Shift-02)

(a) ₹4,295.6 (b) ₹4,296
(c) ₹4,439 (d) ₹4,394

43. What is the compound interest (in ₹) on a sum of ₹25,000 for $3\frac{2}{5}$ years at 10% p.a., if the interest is compounded annually?

SSC Phase-IX 2022

(a) 9606 (b) 8275
(c) 9516 (d) 8425

◆TYPE – IV◆
BASED ON DIFFERENCE OF CI FOR 2 & 3 CYCLE

44. On a sum of money for 2 years compound interest is ₹550 and simple interest is ₹500 respectively. Find the rate of interest (in per annum).

SSC CHSL 08/08/2023 (Shift-03)

(a) 40% (b) 10%
(c) 20% (d) 30%

45. The difference between the simple interest and the compound interest on a certain amount at 9% per annum for two years is ₹162, what is the principal?

SSC CHSL 09/08/2023 (Shift-01)

(a) ₹19700 (b) ₹19000
(c) ₹20000 (d) ₹18500

46. The difference between the compound interest and the simple interest on a given principal is ₹1,725 in 2 years and the rate of interest in both cases is 25% per annum. Find the principal.

SSC CHSL 26/05/2022 (Shift-01)

(a) ₹25,600 (b) ₹26,500
(c) ₹26,400 (d) ₹27,600

47. The difference between compound interest compounded annually and simple interest on a certain sum at a rate of 15% per annum for 2 years is ₹1,944. Find the compound interest compounded annually (in ₹) on the same sum for the same period at a rate of 10% per annum.

SSC CGL 20/04/2022 (Shift-01)

(a) 18,060 (b) 27,216
(c) 18,144 (d) 20,500

48. A deposited ₹1,56,250 at 8% simple interest for 2 years. How much more money will A have in his account at the end of two years, if at the same rate of interest the sum is invested on compound interest, compounded annually

SSC CHSL 11/08/2023 (Shift-02)

(a) ₹1,740.90 (b) ₹1,000
(c) ₹2,000 (d) ₹1,540.40

49. Nutan gets two offers of loan from a bank and an app. The app offered ₹10,000 at 15 percent per annum compounded annually for 2 years and the bank offered the same amount at the same rate for the same time but on simple interest. Find the difference between the interests.

SSC CHSL 10/03/2023 (Shift-03)

(a) ₹375 (b) ₹400
(c) ₹250 (d) ₹225

50. A certain sum was invested at the rate of 10% for a period of 2 years at compound interest compounded annually. The same sum was invested for the same period and same rate of interest at simple interest. if the difference of compound interest and simple interest was ₹200, find the sum.

SSC CHSL 04/08/2023 Shift-04

(a) ₹30,000 (b) ₹25,000
(c) ₹22,000 (d) ₹20,000

51. If the difference between the compound interest and simple interest on a certain sum of money for 3 years at the rate of 4% per annum is ₹76, then what is the sum?

SSC CHSL 04/08/2023 (Shift-01)

(a) ₹16,725 (b) ₹12,925
(c) ₹15,625 (d) ₹18,825

52. Find the difference between the compound interest and simple interest when a sum of ₹15,625 is invested for 3 years at 4% per annum.

SSC CPO 10/11/2022 (Shift-03)

(a) ₹76 (b) ₹96
(c) ₹56 (d) ₹86

53. On what sum of money will the difference between the simple interest and compound interest (Compounded annually) for 3 years at 5% per annum be ₹15.25?

SSC MTS 13/09/2023 (Shift-01)

(a) ₹2,000 (b) ₹2,500
(c) ₹4,000 (d) ₹1,000

54. Find the difference between the simple interest and the compound interest payable annually on a sum of ₹6,500 at 7% per annum for 3 years. (Correct two decimal places.)

SSC CPO 09/11/2022 (Shift-02)

(a) ₹94.34 (b) ₹97.78
(c) ₹98.73 (d) ₹95.67

55. Calculate the difference between the compound interest and the simple interest on a sum of ₹5,000 at the rate of 8% for 3 years (to nearest integer).

SSC CHSL 26/05/2022 (Shift-03)

(a) ₹108 (b) ₹105
(c) ₹102 (d) ₹99

◆ TYPE – V ◆
COMBINATION OF CI & SI BOTH

56. ₹6000 is lend at the annual rate of 10 percent for 2 years. Which of the following statement(s) is/are correct?

I. Simple interest to be received on this sum is ₹1200.

II. Compound Interest (compounding annually) to be received on this sum is ₹1260.

SSC CHSL 10/03/2023 (Shift-02)

(a) Statement I is correct
(b) Both statement I and II are correct
(c) Statement II is correct.
(d) None of them are correct.

57. What is the compound interest (in ₹) at the rate of 10%, compounded annually, for 3 years on the principal which in 8 years at the rate of 12% per annum gives ₹4,800 as simple interest?

SSC CGL 19/04/2022 (Shift-03)

(a) 1,505 (b) 1,655
(c) 1,455 (d) 2,015

58. The compound interest (compounded annually) on a certain sum of money for 2 years at 60 per cent per annum is ₹6240. What will be the simple interest on the same sum of money and the same rate of interest for 3 years?

SSC MTS 09/05/2023 (Shift-02)

(a) ₹6800 (b) ₹7200
(c) ₹7100 (d) ₹6500

59. The difference in the compound interest on a certain sum at 10% p.a. for one year, when the interest is compounded half yearly and yearly, is ₹88.80. What is the simple interest on this same sum for $1\frac{2}{3}$ years at the same rate?

SSC CGL 4/03/2020 (Shift-02)

(a) ₹5,916 (b) ₹5,986
(c) ₹5,980 (d) ₹5,920

60. A certain sum amounts to ₹14,641 in 4 years at 10% p.a. when interest is compounded annually. What will be the amount of the same sum (in ₹) in $3\frac{2}{5}$ years at the same rate at simple interest?

SSC Phase-IX 2022

(a) 14000 (b) 13600
(c) 13400 (d) 13200

61. A certain sum amounts to ₹11,520 in 4 years at the rate of 15% p.a. simple interest. What will be the amount of the same sum in 2 years at the same rate, if the interest is compounded 8-monthly (nearest to a ₹)?

SSC Phase-IX 2022

(a) ₹9853 (b) ₹9338
(c) ₹9583 (d) ₹9538

62. A certain amount of money was lent for a period of 1 year 9 months at a rate of 10% per annum compounded annually. If the compound interest is ₹1460, find the amount of money lent.

SSC CHSL 02/08/2023 Shift-01

(a) ₹8200 (b) ₹7500
(c) ₹6000 (d) ₹8000

63. Varun and Madhur invested ₹25,000 each in different schemes. Varun earned simple interest at 11% per annum, whereas Madhur earned compound interest at 10% per annum compounded annually. Who received more interest after 2 years and how much?

SSC CHSL 04/08/2021 (Shift-02)

(a) Madhur, ₹302.50
(b) Varun, ₹250
(c) Madhur, ₹250
(d) Varun, ₹500

64. The simple interest accrued on a certain principal is ₹1200 in 3 years at the rate of 8% per annum. What would be the compound interest (compounding annually) accrued on twice of that principal at the rate of 10% per annum in 2 years?

SSC CHSL 13/03/2023 (Shift-01)

(a) ₹1,050 (b) ₹2,150
(c) ₹2,100 (d) ₹1,100

65. A moneylender borrows money at 4% per annum and pays the interest at the end of the year. He lends it at 8% per annum compound interest, compounded half-yearly, and receives the interest at the end of the year. In this way, he gains ₹166.4 a year. Find the amount of money he borrows.

DP CONSTABLE 28/11/2023 (Shift-01)

(a) ₹6,500 (b) ₹4,000
(c) ₹5,050 (d) ₹4,500

66. The simple interest on a sum of money at 10% per annum for 4 years is ₹3,200. What will be the amount (in ₹) of the same sum for the same period at the same rate of interest when the interest is compounded annually?

SSC CGL 20/04/2022 (Shift-02)

(a) 11,172.80 (b) 11,712.80
(c) 11,127.80 (d) 11,217.80

67. The simple interest on a sum of money at 10% per annum for 2 years is ₹8,100. What would be the compound interest (in ₹) on the same sum for the period at 15% p.a. when the interest is compounded yearly? (nearest to ₹1)

SSC CPO 25/11/2020 (Shift-02)

(a) 13,061 (b) 14,671
(c) 8,100 (d) 12,751

68. The simple interest on a sum of ₹8,000 at certain rate percent per annum for 3 years is ₹3,600. What will be the amount (in ₹) of the same sum after 2 years at the same rate, if the interest is compounded 8-monthly?

SSC CHSL 05/08/2021 (Shift-01)

(a) ₹10,580 (b) ₹10,450
(c) ₹10,648 (d) ₹11,239

69. The simple interest on a certain sum for 3 years at 12% p.a. is ₹6,750. What is the compound interest (in ₹) on the same sum for 2 years at 20% p.a., if interest is compounded half-yearly? (rounded off to the nearest ₹)

SSC CHSL 12/04/2021 (Shift-03)

(a) ₹8000 (b) ₹8702
(c) ₹6750 (d) ₹7729

70. A certain sum amounts to ₹ 15,500 in 2 years at 12% p.a. simple interest. The same sum will amount to what in $1\frac{1}{2}$ years at 10% p.a., if the interest is compounded half yearly (nearest to ₹1)?

SSC CGL TIER-II 15/11/2020

(a) ₹ 14,470 (b) ₹ 13,460
(c) ₹ 14,360 (d) ₹ 15,125

71. The simple interest on a certain sum of P at a rate of r% per annum for 3 years is ₹11,250 and the compound interest on the same sum for 2 years at the same rate percent p.a. is ₹7,650. What is the value of P and r, respectively?

SSC Phase-IX 2022

(a) ₹92500 & 6% (b) ₹92500 & 7%
(c) ₹93750 & 4% (d) ₹93750 & 5%

72. A sum of ₹3125 amounts to ₹3515.20 in 3 years at x% p.a., interest being compounded yearly. What will be the simple interest (in ₹) on the same sum and for the same time at $(x + 2)$% p.a.?

SSC CGL 18/08/2021 (Shift-02)

(a) 554 (b) 562.50
(c) 565.50 (d) 550

◆ TYPE – VI ◆

TO FIND RATE

73. At what annual rate will a sum of ₹6,400 yield ₹1,344 as compound interest (compounded annually) in 2 years?

MTS 06/09/2023 (Shift-02)

(a) 5% (b) 12%
(c) 10% (d) 8%

74. The compound interest on a sum of ₹8,000 becomes ₹9,261 in 18 months. Find the rate of interest if interest is compounded half-yearly.

DP CONSTABLE 14/11/2023 (Shift-03)

(a) 8% (b) 10%
(c) 20% (d) 12%

75. A sum becomes 1.96 times of itself in 2 years when invested at compound interest (compounding annually). What is the annual rate of interest?

SSC CHSL 16/03/2023 (Shift-04)

(a) 20% (b) 25%
(c) 40% (d) 30%

76. At what rate percentage per annum will ₹14,400 amount to ₹15,876 in one year, if interest is compounded half-yearly?

SSC Phase-IX 2022

(a) 15% (b) 12%
(c) 8% (d) 10%

77. Hema invested ₹1728 at the rate of compound interest (Compounded annually) for 3 years. She got ₹4,096 after the specified period. Find the rate of interest per annum Compounded annually.

SSC MTS 12/09/2023 (Shift-01)

(a) $33\frac{1}{3}$% (b) $33\frac{1}{2}$%
(c) $30\frac{1}{2}$% (d) $30\frac{1}{3}$%

78. At what rate of annual compound interest, the interest on ₹20000 compounded half-yearly in 1 year 6 months becomes ₹23152.50?

SSC MTS 04/05/2023 (Shift-02)

(a) 10% yearly (b) 5% yearly
(c) 12% yearly (d) 8% yearly

79. A sum of ₹9500 amounts to ₹11495 in 2 years at a certain rate percent per annum, interest compounded yearly. What is the simple interest (in ₹) on the same sum for the same time and double the rate?

SSC CGL 24/08/2021 (Shift-01)

(a) 3420 (b) 3990
(c) 3800 (d) 4560

◆ TYPE – VII ◆

TO FIND TIME

80. In how many years will a sum of ₹18,000 amount to ₹23,958 at the annual rate of 20% compounded half yearly?

MTS 05/09/2023 (Shift-03)

(a) $1\frac{1}{4}$ (b) $1\frac{1}{2}$
(c) $2\frac{1}{2}$ (d) $3\frac{1}{2}$

81. The compound interest on ₹10,000 at 20% per annum is ₹4,641. when interest is compounded half-yearly, then for how many years was the sum invested?

SSC CGL TIER II 26/10/2023

(a) 2 years (b) 3 years
(c) 4 years (d) 6 years

82. In how many years will ₹1,60,000 become ₹2,79,841 at a compound interest (Compounded annually) rate of 15% per annum?

SSC MTS 11/09/2023 (Shift-03)

(a) 6 years (b) 3 years
(c) 4 years (d) 5 years

83. A sum becomes ₹33800 in 2 years and ₹43,940 in 3 years, when lent in a scheme of compound interest (compounding annually). If double the sum is invested in the same scheme for 2 years, then what will be the amount obtained at end of 2 years?

SSC MTS 13/06/2023 (Shift-01)

(a) ₹62480 (b) ₹67600
(c) ₹71240 (d) ₹60,420

84. In how many years will a sum of ₹800 become ₹1216.70 at 30% per annum C.I. compounding half-yearly?

SSC Phase-X 04/08/2022 (Shift-03)

(a) 2 year (b) 1 year
(c) 2.5 year (d) 1.5 year

85. The compound interest on ₹18,000 at 7% per annum, compounded annually, is ₹1,260. What is the period of time?

SSC MTS 25/07/2022 (Shift-03)

(a) 1 years (b) 2 years
(c) 3 years (d) 4 years

86. A sum of ₹7500 amounts to ₹9075 at 10% p.a. interest being compounded yearly in a certain time. The simple interest (in ₹) on the same sum for the same time and the same rate is:

SSC CGL 16/08/2021 (Shift-01)

(a) 1500 (b) 1480
(c) 1520 (d) 1530

87. A sum of ₹ 8,000 invested at 10% p.a. amounts to ₹ 9,261 in a certain time, interest compounded half-yearly. What will be the compound interest (in ₹) on the same sum for the same time at double the earlier rate of interest, when interest is compounded annually?

SSC CGL 04/03/2020 (Shift-03)

(a) ₹2,520 (b) ₹2,480
(c) ₹2,560 (d) ₹2,500

◆ TYPE – VIII ◆
MUNNI METHOD

88. A sum amounts to ₹6580 in 2 years and amounts to ₹7896 in 3 years on compound interest (compounding annually) at the same rate of interest. What is the annual rate of interest?

SSC CHSL 17/03/2023 (Shift-04)

(a) 30% (b) 40%
(c) 15% (d) 20%

89. A sum of money amounts to ₹1,200 in 2 years and becomes ₹1,260 in 3 years at compound interest, when interest is compounded annually. What is the rate of compound interest per annum?

SSC CPO 04/10/2023 (Shift-03)

(a) 6% (b) 3%
(c) 5% (d) 7%

90. A sum of money becomes ₹6,400 in 3 years and ₹8,100 in 5 years on compound interest compounded annually. Find the rate of interest per annum.

SSC MTS 01/09/2023 (Shift-02)

(a) $12\frac{3}{4}\%$ (b) $12\frac{5}{8}\%$
(c) $12\frac{3}{8}\%$ (d) $12\frac{1}{2}\%$

91. A sum amounts to ₹6,120 in 2 years and ₹7,340 in 3 years at compound interest. The sum (in ₹) is (rounded off to 2 decimal places):

SSC CHSL 03/08/2023 (Shift-02)

(a) 4,050.13 (b) 4,254.63
(c) 4,850.32 (d) 4,560.23

92. The amount received on a certain sum after 3 years and 5 years on compound interest (compounding annually) is ₹20,736 and ₹29,859.84 respectively. What is that sum?

SSC MTS 14/06/2023 (Shift-03)

(a) ₹9000 (b) ₹14000
(c) ₹15000 (d) ₹12000

93. A sum invested at compound interest amounts to ₹7,800 in 3 years and ₹11,232 in 5 years. What is the rate of interest?

SSC CGL 11/04/2022 (Shift-02)

(a) 26% (b) 20%
(c) 15% (d) 18%

94. On a certain sum the compound interest (compounding annually) for fourth year is ₹15000 and the compound interest (compounding annually) for sixth year is ₹25350. What is the rate of interest per annum?

SSC MTS 20/06/2023 (Shift-01)

(a) 35% (b) 30%
(c) 40% (d) 25%

95. On a certain sum, the interest is compounded annually. If the compound interest for the second year is ₹400 and the compound interest for the fourth year is 576, then what is the rate of interest per annum?

SSC MTS 20/07/2022 (Shift-02)

(a) 20% (b) 25%
(c) 15% (d) 44%

96. A sum amounts to ₹7,562 in 4 years and to ₹8,469.44 in 5 years, at a certain rate percent per annum when the interest is compounded yearly. If ₹10,000 at the same rate of interest is borrowed for two years, then what will be the compound interest (in ₹)?

SSC CPO 25/11/2020 (Shift-01)

(a) 2,544 (b) 2,764
(c) 1,965 (d) 1,736

◆ TYPE – IX ◆
PRINCIPAE BECOMES N TIME AFTER T YEARS

97. A sum of money at compound interest doubles itself in 4 years. In how many years does the sum become 8 times of itself at the same rate of interest?

SSC CPO 27/06/2024 (Shift-01)

(a) 15 years (b) 12 years
(c) 8 years (d) 10 years

98. A certain amount of money becomes thrice in 5 years at compound interest. How many years it will take to become 9 times?

SSC CPO 28/06/2024 (Shift-01)

(a) 15 years (b) 8 years
(c) 10 years (d) 25 years

99. Money is doubled in a bank account in 7 years, when the interest is compounded annually. What time in years is needed to make an amount 8 times in the bank?

SSC MTS 14/09/2023 (Shift-02)

(a) 35 years (b) 28 years
(c) 21 years (d) 14 years

◆ TYPE – X ◆
MISCELLANEOUS QUESTIONS

100. A sum of ₹4,000 is lent at 10% p.a., interest compounded annually. What is the difference between the compound interest for the 2nd year and the 3rd year?

SSC MTS 08/10/2021 (Shift-02)

(a) ₹44.00 (b) ₹45.40
(c) ₹46.50 (d) ₹45.00

101. Mukesh invested ₹100000 in a company. He would be paid interest at 7% per annum compounded annually. Find the interest for the 3rd year.

CISF HC 30/10/2023 (Shift-01)

(a) ₹8200.33 (b) ₹7550.53
(c) ₹8333.33 (d) ₹8014.3

102. A sum of money becomes two times of itself in 8 years at simple interest, and it becomes four times of itself in 2 years at compound interest, when interest is compounded annually. Find the ratio of the rate of simple interest to the rate of compound interest offered per year.

SSC MTS 05/07/2022 (Shift-03)

(a) 2 : 3 (b) 3 : 5
(c) 3 : 5 (d) 1 : 8

103. The difference between the compound interests on a certain sum for $1\frac{1}{2}$ years at a rate of 20% p.a. is ₹1,716 when the interest is compounded half yearly and compounded annually. The sum (in ₹) is:

ICAR 29/07/2022 (Shift-01)

(a) 1,32,000 (b) 1,43,000
(c) 2,14,500 (d) 1,56,000

104. A sum of ₹1,00,000 was taken from a bank at the rate of 7% p.a. to be compounded annually for 5 years. Calculate the compound interest. (Closest to a ₹)

SSC CPO 03/10/2023 (Shift-02)

(a) 40,587 (b) 40,000
(c) 20,963 (d) 40,255

105. Find the amount of ₹75,000 for one year at the rate of 16% per annum, if the interest is compounded quarterly (rounded off to two decimal places).

SSC MTS 05/09/2023 (Shift-02)

(a) ₹87,937.40 (b) ₹89,773.40
(c) ₹87,739.40 (d) ₹87,379.40

106. If 10 percent per annum rate of compound interest compounded yearly is equivalent to the x percent per annum rate of compound interest compounded half yearly, then what is the value (Approximate) of x?

SSC CHSL 14/03/2023 (Shift-02)

(a) 6.25% (b) 5.32%
(c) 4.88% (d) 4.55%

107. A man invested a total of ₹12,050 in two parts, one at 10% p.a. simple interest for 2 years and the other at the same rate at compound interest, interest being compounded annually, for the same time. The amount he received from both the parts are equal. The sum (in ₹) invested at the compound interest is:

SSC CHSL 15/04/2021 (Shift-01)

(a) ₹5,850 (b) ₹6,000
(c) ₹5,780 (d) ₹5,800

108. A and B together borrowed a sum of ₹ 51,750 at an interest rate of 7% p.a. compound interest in such a way that to settle the loan, A paid as much amount after three years as paid by B after 4 years from the day of borrowing. The sum (in ₹) borrowed by A was :

SSC CGL 05/03/2020 (Shift-02)

(a) ₹25,000 (b) ₹25,650
(c) ₹24,860 (d) ₹26,750

109. The compound interest on a sum of ₹12,000 at a rate of x % p.a. for $1\frac{1}{2}$ years is ₹3,840, compounded yearly. What will be the compound interest on the same sum at the same rate and for the same period if the interest is compounded half-yearly?

ICAR 29/07/2022 (Shift- 03)

(a) ₹3,972 (b) ₹3,876
(c) ₹3,944 (d) ₹3,846

110. Joseph deposited a total of ₹52,500 in a bank in the names of his two daughters aged 15 years and 16 years in such a way that they would get equal amounts when they become 18 years old. If the bank gives 10% compound interest compounded annually, then what is the amount (in ₹) that Joseph had deposited in the name of his younger daughter ?

SSC CGL 18/04/2022 (Shift-02)

(a) 25,500 (b) 26,000
(c) 24,500 (d) 25,000

111. Divide ₹66,300 between A and B in such a way that the amount that A receives after 8 years is equal to the amount that B receives after 10 years; with compound interest being compounded annually at a rate of 10% per annum.

SSC CGL 20/04/2022 (Shift-03)

(a) A = ₹35,200, B = ₹31,100
(b) A = ₹36,300, B = ₹30,000
(c) A = ₹37,000, B = ₹29,300
(d) A = ₹35,520, B = ₹30,810

112. Nidhi invested her savings in schemes A and B in the ratio 2 : 3, respectively, for $1\frac{1}{2}$ years. Scheme A offers interest at 20% p.a. compounded half yearly, while Scheme B offers interest at 10% p.a. compounded yearly. If the total interest received by her from both the schemes is ₹13,524, then the amount (in ₹) invested by her in Scheme A is:

ICAR 29/07/2022 (Shift- 01)

(a) 36,000 (b) 24,000
(c) 15,000 (d) 18,000

113. A certain sum was invested for three years in a scheme in which the interest gets compounded annually. During the first two years, the scheme provided growths at the rates of 80% and 60%, respectively, but during the third year there was a decline by 40%. What was the overall interest rate for three years?

SSC MTS 12/10/2021 (Shift-02)

(a) 22.5% (b) 24%
(c) 20% (d) 48.6%

◆ TYPE – XI ◆
INSTALLMENT

114. Loan is to be repaid in two equal yearly installments. If the rate of interest is 10% per annum, compounded annually, and each installment is ₹6,897, then find the total interest charged.

SSC CHSL 27/05/2022 (Shift-01)

(a) ₹1,644
(b) ₹1,824
(c) ₹1,914
(d) ₹1,734

115. A loan of ₹2,550 is to be paid back in two equal half-yearly installments. How much is each installment if the interest is compounded half-yearly at 8% p.a.?

SSC Phase-XII 24/06/2024 (Shift-01)

(a) ₹1250 (b) ₹1352
(c) ₹1745 (d) ₹1457

116. An item is bought on a condition that three equal installments of ₹3,993 are to be paid at a rate of 10% compound interest, compounded annually. The cost of the item is:

SSC Phase-XI 27/06/2023 (Shift-01)

(a) ₹10,000 (b) ₹9,050
(c) ₹9,590 (d) ₹9,930

117. A loan of ₹8,925 is to be paid back in two equal half-yearly installments. How much is each installment if the interest is compounded half-yearly at 8% per annum?

SSC CHSL 24/05/2022 (Shift-01)

(a) ₹4,372 (b) ₹4,732
(c) ₹4,654 (d) ₹4,564

118. A loan is to be returned in two equal yearly installments. If the rate of interest is 10% p.a., compounded annually and each installment is ₹6534, then the total interest charged (in ₹) is:

SSC CGL 20/08/2021 (Shift-03)

(a) 1728 (b) 1867
(c) 1642 (d) 1579

119. A certain loan was returned in two equal half yearly installments each of ₹6,760. If the rate of interest was 8% p.a., compounded yearly, how much was the interest paid on the loan?

SSC CGL TIER-II 13/09/2019

(a) ₹750 (b) ₹810
(c) ₹790 (d) ₹770

120. A loan is to be returned in two equal yearly installments. If the rate of interest is 10% p.a. compounded annually and each installment is ₹5,808 then 60% of the total interest (nearest to a ₹) charged in this scheme is:

SSC CGL Tier-II 29/01/2022

(a) 917 (b) 911
(c) 913 (d) 922

121. Surekha borrowed a sum of money and returned it in two equal annual installments of ₹ 5547 each. If the rate of interest was $7\frac{1}{2}\%$ p.a. compounded yearly, then the total interest paid by her was :

SSC CGL TIER-II 15/11/2020

(a) ₹ 1,144
(b) ₹ 1,134
(c) ₹ 1,096
(d) ₹ 1,126

122. A sum of ₹6,000 is to be paid back in two equal annual installments. Each installment is to be paid at the end of every year. How much is each installment if the interest is compounded annually at 2% p.a.? (Rounded off up to two decimal places)

SSC CGL 02/12/2022 (Shift-01)

(a) ₹2,092.29
(b) ₹3,090.30
(c) ₹2,291.29
(d) ₹3,589.30

123. Sita takes a loan of ₹35,000 at an interest rate of 10% compound interest, compounded annually. She agrees to pay two equal installments in 2 years, one installment at the end of each year. Find the value of each installment. (Round off to the nearest integer)

SSC CPO 29/06/2024 (Shift-01)

(a) ₹20,167 (b) ₹40,167
(c) ₹10,167 (d) ₹30,167

124. Rajnish borrowed ₹1,500 from a bank and repaid the entire amount with interest in two equal annual installments, the first installment being paid one year after Rajnish borrowed from the bank. If the rate of interest was 40% per annum, compounded annually, then what was the value (in ₹) of each installment paid by Rajnish?

SSC CGL TIER- II 07/03/2023

(a) 1125 (b) 1470
(c) 1225 (d) 1350

125. A mobile phone is available for ₹79,860 by cash payment or by paying cash of ₹60,000 as down payment and the remaining amount in three equal annual installments. If the shopkeeper charges interest at the rate of 10% per annum compounded annually, then the amount of each installment (in ₹) will be:

SSC CHSL 16/04/2021 (Shift-02)

(a) ₹6,789 (b) ₹7,986
(c) ₹6,000 (d) ₹6,689

126. A money lender finds that due to the fall in the annual rate of interest from 18% to 15%, his yearly income diminishes by ₹750. His capital is:

SSC Phase-XI 30/06/2023 (Shift-01)

(a) ₹25,500
(b) ₹25,000
(c) ₹5,000
(d) ₹2,500

127. Geeta deposited a certain sum of money in her bank account which amounted to ₹27,783 in 3 years at 5% per annum, the interest being compounded annually. What amount did she deposit?

SSC MTS 01/09/2023 (Shift-01)

(a) ₹25,000 (b) ₹24,000
(c) ₹25,500 (d) ₹26,000

128. A man borrowed ₹50,000 from a bank at 10% per annum, compounded annually. At the end of every year, he pays ₹15,000 as part payment of the loan and interest. How much does he still owe to the bank after three such installments?

SSC CPO 10/11/2022 (Shift-01)

(a) ₹16,900 (b) ₹15,800
(c) ₹15,200 (d) ₹16,200

129. Amit borrows a sum of ₹8,000 at 10% p.a. compound interest for 4 years. He repays ₹2,800 at the end of the first year and ₹2,600 at the end of the second year. To clear the loan, how much should he pay after 4 years, interest being compounded yearly?

SSC MTS 27/10/2021 (Shift-02)

(a) ₹4800
(b) ₹4880
(c) ₹4840
(d) ₹4780

130. A man borrowed a certain sum and agrees to repay it by paying ₹4000 at the end of first year and ₹7700 at the end of second year. If the rate of compound interest compounded annually is 10% per annum, then find the sum (in ₹)

SSC CGL 17/08/2021 (Shift-03)

(a) 11500
(b) 11000
(c) 9000
(d) 10000

131. A person borrowed a sum of ₹30800 at 10% p.a. for 3 years, interest compounded annually. At the end of two years, he paid a sum of ₹13268. At the end of 3rd year, he paid ₹x to clear of the debt. What is the value of x?

SSC CGL 23/08/2021 (Shift-03)

(a) 26200 (b) 26620
(c) 26400 (d) 26510

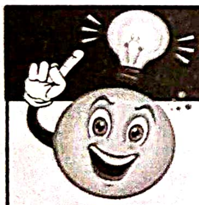
132. A certain sum is deposited for 4 years at a rate of 10% per annum on compound interest compounded annually. The difference between the interest at the end of 2 years and that at the end of 4 years is ₹5082. Find the sum (in ₹)

SSC CGL 11/04/2022 (Shift-01)

(a) 20000 (b) 25500
(c) 50820 (d) 10164

ANSWER KEY

1.	(c)	2.	(b)	3.	(c)	4.	(b)	5.	(b)	6.	(d)	7.	(c)	8.	(a)	9.	(d)	10.	(c)
11.	(d)	12.	(a)	13.	(d)	14.	(d)	15.	(d)	16.	(b)	17.	(b)	18.	(b)	19.	(a)	20.	(d)
21.	(d)	22.	(d)	23.	(a)	24.	(d)	25.	(b)	26.	(a)	27.	(a)	28.	(a)	29.	(a)	30.	(a)
31.	(c)	32.	(d)	33.	(d)	34.	(a)	35.	(d)	36.	(a)	37.	(c)	38.	(a)	39.	(b)	40.	(d)
41.	(c)	42.	(a)	43.	(a)	44.	(c)	45.	(c)	46.	(d)	47.	(c)	48.	(b)	49.	(d)	50.	(d)
51.	(c)	52.	(a)	53.	(a)	54.	(b)	55.	(d)	56.	(b)	57.	(b)	58.	(b)	59.	(d)	60.	(c)
61.	(c)	62.	(d)	63.	(b)	64.	(c)	65.	(b)	66.	(b)	67.	(a)	68.	(c)	69.	(b)	70.	(a)
71.	(c)	72.	(b)	73.	(c)	74.	(b)	75.	(c)	76.	(d)	77.	(a)	78.	(a)	79.	(c)	80.	(b)
81.	(a)	82.	(c)	83.	(b)	84.	(d)	85.	(a)	86.	(a)	87.	(c)	88.	(d)	89.	(c)	90.	(d)
91.	(b)	92.	(d)	93.	(b)	94.	(b)	95.	(a)	96.	(a)	97.	(b)	98.	(c)	99.	(c)	100.	(a)
101.	(d)	102.	(d)	103.	(d)	104.	(d)	105.	(c)	106.	(c)	107.	(b)	108.	(d)	109.	(a)	110.	(d)
111.	(b)	112.	(b)	113.	(c)	114.	(b)	115.	(b)	116.	(d)	117.	(b)	118.	(a)	119.	(d)	120.	(d)
121.	(b)	122.	(b)	123.	(a)	124.	(c)	125.	(b)	126.	(b)	127.	(b)	128.	(a)	129.	(c)	130.	(d)
131.	(c)	132.	(a)																



SPEED BOOSTER HACKS

◆ Table for successive percentage change ◆

Rate	2 years (cycle)	3 years (cycle)	4 years (cycle)
5%	10.25%	15.7625%	21.55%
6%	12.36%	19.1016%	26.24%
7%	14.49%	22.50%	31.08%
8%	16.64%	25.97%	36.05%
9%	18.81%	29.50%	41.16%
10%	21%	33.1%	46.41%
15%	32.25%	52.09%	74.90%
20%	44%	72.8%	107.36%

SOLUTIONS

1. (c) Equivalent rate of CI at 8% p.a. for 2 yrs.

$= 8+8+\frac{8\times 8}{100} = 16.64\%$

CI = 16.64% of 62500 = ₹10400

Alternate Method:

$8\% = \frac{2}{25}$

P A

1st year → 25 : 27

2nd year → 25 : 27

625 : 729

CI

×100 ↓ +104 $\xrightarrow{\times 100}$ Rs.10400

Rs.62500

2. (b) P = 12,000

$R_1 \rightarrow 5\% = \frac{1}{20}$, $R_2 \rightarrow 10\% = \frac{1}{10}$

P A

Ist year → 20 : 21

IInd year → 10 : 11

200 : 231

CI

×60 ↓ 31 unit → 60×31

₹12000 =₹1860

Alternate Method:

Equivalent rate $= \left(5+10+\frac{5\times 10}{100}\right)\%$

= 15.5%

CI = 15.5% of 12000 = ₹1860

3. (c) $\text{Rate}_1 = 2.5\% = \frac{1}{40}$ for first year

$\text{Rate}_2 = 2\% = \frac{1}{50}$ for second year

P A

Ist year → 40 : 41

IInd year → 50 : 51

2000 : 2091

CI

×3 ↓ 91 unit $\xrightarrow{\times 3}$ $\boxed{₹273}$

₹6000

4. (b) P = 8000, R = 10%(half-yearly)

t = 2 half years

$\therefore CI = \frac{21}{100}\times 8000 = ₹1680$

5. (b) Rate of interest = 18%

Equivalent rate of CI at 18% for 2 years

$= \left(18+18+\frac{18\times 18}{100}\right)\% = 39.24\%$

We have, 39.24% = ₹981

∴ Present value of the given sum

$= \frac{981}{39.24}\times 100 = ₹2500$

Alternate Method:

P A

1st cycle → 50 : 59

2nd cycle → 50 : 59

2500 : 3481

CI

×1 ↓ 981units $\xrightarrow{\times 1}$ ₹981

₹2500

6. (d) Total CI of 2 years at 5% = 10.25%

Amount = 110.25%

110.25% = 13230

1% = 120

100% = 12000

Alternate Method:

$5\% = \frac{1}{20} \rightarrow \frac{21}{20}$

P A

20 : 21

20 : 21

400 : 441

↓ ↓×30

12000 13230

7. (c) $\text{Rate} = 20\% = \frac{1}{5}$

P A

5 : 6

5 : 6

25 : 36

CI

↓ 11 unit $\xrightarrow{\times 380}$ 4180

9500

Alternate Method:

Rate = 20%

Effective rate $= \left(20+20+\frac{20\times 20}{100}\right)\%$

= 44%

$P = \frac{4180}{44}\times 100 = ₹9500$

8. (a) $12\% = \frac{3}{25}$

P A

25 : 28

25 : 28

625 : 784

CI

↓ 159 units $\xrightarrow{\times 64}$ 10176

40000

Alternate Method:

Effective rate $= \left(12+12+\frac{12\times 12}{100}\right)\%$

= 25.44%

25.44% = 10176 ⇒ 100% = 40000

9. (d) ATQ,

Effective rate $= \left(8+8+\frac{8\times 8}{100}\right)\%$

= 16.64%

Required interest $= 20000\times\frac{16.64}{100}$

= ₹3328

10. (c) Time = 1 year = 2 cycles of 6 months

R = 5% yearly

$R = \frac{5}{2}\% = 2.5\%$ (half-yearly)

Effective rate $= \left(2.5+2.5+\frac{2.5\times 2.5}{100}\right)\%$

= 5.0625%

Difference = 0.0625% × 6400

= ₹4

11. (d) Simple Interest for 1 year = 16%

Rate for CI $= \left(8+8+\frac{8\times 8}{100}\right)\%$

= 16.64%

Difference = (16.64 – 16)%= 0.64%

∵ 0.64% = 60

$\therefore 100\% = \frac{60}{0.64}\times 100 = ₹9375$

12. (a) CI rate for yearly = 8%

But CI calculated in half-yearly

Rate = 4%, Time = 2 (half-yearly)

Effective rate $= \left(4+4+\frac{4\times 4}{100}\right)\% = 8.16\%$

Difference % = 8.16 – 8 = 0.16%

$\text{Difference} = 150000\times\frac{0.16}{100} = ₹240$

13. (d) R = 8% ⇒ Time = 2 years

SI for 2 years = 16%

Effective rate at 8% for 2 years

$= \left(8+8+\frac{8\times 8}{100}\right)\% = 16.64\%$

Given , 16.64% → 6656

$SI\ (16\%) = \frac{6656}{16.64}\times 16 = ₹6400$

14. (d) Scheme A,

Effective rate =

$\left(10+10+\frac{10\times 10}{100}\right)\% = 21\%$

Scheme B,

Effective rate

$= \left(12+12+\frac{12\times 12}{100}\right)\% = 25.44\%$

21% → 1050

$25.44\% \rightarrow \frac{1050}{21}\times 25.44 = ₹1272$

15. (d) Equivalent rate for 3 years at 10% = 33.1%

CI = 33.1% of 25000 = ₹8275

Alternate Method:

P A

1st year → 10 : 11

2nd year → 10 : 11

3rd year → 10 : 11

1000 : 1331

×25 ↓ 331unit $\xrightarrow{\times 25}$ ₹8275

₹25000

16. (b) Principal Amount

10 : 11

10 : 11

10 : 11

1000 : 1331

×21 ↓ ↓×21

₹21000 $\boxed{₹27951}$

SMART APPROACH:-

By successive method

We know Effective rate for 3 year at 10% = 33.1% then,

amount = 133.1%

Given, that

100% = 21000

Then,

Amount (133.1%) =

$\frac{21000}{100}\times 133.1 = \text{Rs. } 27951$

17. (b) P = 5,500 R = 15% ⇒ T = 2 year
When interest is Compounded 8 monthly, $R = \frac{15}{12} \times 8 = 10\%$,

$T = \frac{24}{8} = 3$ cycles

Effective rate of CI at 10% for 3 cycles = 33.1%

$CI = \frac{5,500}{100} \times 33.1 = 1820.50$

18. (b) P = 10,000, $T = \frac{3}{2}$,
$T^1 = 3$(half-yearly)
R = 20%, $R^1 = 10\%$ (half-yearly)
Equivalent rate of CI at 10% for 3 cycle = 33.1%

$\therefore CI = 10000 \times \frac{33.1}{100} = ₹3310$

19. (a) $\text{Rate} = \frac{8}{2} = 4\% = \frac{1}{25}$

$\text{Time} = 18 \times \frac{1}{6} = 3$ cycles

P A
1st cycle → 25 : 26
2nd cycle → 25 : 26
3rd cycle → 25 : 26
15625 : 17576

We have, 15625 units = ₹7500

$\therefore \text{Amount} = \frac{7500}{15625} \times 17576 = ₹8436.48$

20. (d) P = 15750,
R = 20% (yearly) = 10% (half-yearly)
time = 2 years
time = 4 cycle (half yearly)
Effective rate at 10% for 4 cycles = 46.41%
CI = 15750 × 46.41% = ₹7309.575

21. (d) R = 4% yearly, R = 1% quarterly
effective rate for 1 year = 4.06

$CI = 10,000 \times \frac{4.06}{100} = 406$

Hence C > ₹400

Alternate Method:

$\text{SI of 1 year} = 10,000 \times \frac{4}{100} = 400$

CI always be greater than SI, So option (d) C > ₹400

22. (d) Amount = ₹9826

$\text{Rate} = 2\frac{1}{2}\% = \frac{5}{2}\%$ Yearly,

$= \frac{5}{4}\%$ (Half yearly) $= \frac{1}{80}$

Time = 18 months (yearly)
= 3 cycles (Half yearly)

P A
1st year → 80 : 81
2nd year → 80 : 81
3rd year → 80 : 81
512000 : 531441

We have, 531441 units = ₹9826

$\therefore \text{Principal} = \frac{9826}{531441} \times 512000$
= ₹9466.55

23. (a) $\text{Rate} = 12\% = \frac{3}{25}$

P A
Ist year → 25 : 28
IInd year → 25 : 28
IIIrd year → 25 : 28
15625 : 21952

$$\begin{tikzcd} 15625 \arrow[r, bend right, "CI"'] \arrow[d, "\times\frac{8}{5}"'] & 21952 \\ ₹25000 & 6327\text{ unit} \xrightarrow{\times\frac{8}{5}} \boxed{₹10123.20} \end{tikzcd}$$

24. (d) $R = \frac{10}{2}\% = 5\% = \frac{+1}{20} = \frac{21}{20}$
t = 3 half years
Amount = 64,827

P A
Isthalf year → 20 : 21
IIndhalf year → 20 : 21
IIIrdhalf year → 20 : 21
8000 : 9261

$$\begin{tikzcd} 8000 \arrow[d, "\times 7"] & 9261 \arrow[d, "\times 7"] \\ \boxed{₹56000} & ₹64827 \end{tikzcd}$$

25. (b) $\text{Time} = 1\frac{1}{2}$ years = 3 half years
Rate = 8% (yearly) = 4% (Half yearly)

$\because 4\% = \frac{1}{25} \xrightarrow{+} \frac{26}{25}$

For 3 half years

$(25)^3 : (26)^3$
15625 : 17576

$$\begin{tikzcd} 15625 \arrow[d] & 17576 \arrow[d] \\ \boxed{15625} & 17576 \end{tikzcd}$$

26. (a) Sum = 8000 (given)
Rate = 20% yearly = 10% (half yearly)

$\text{Time} = \frac{18}{6} = 3$ (half years)

Effective rate = 33.1%

$\text{Amount} = \frac{8000}{100} \times 133.1 = 10648$

27. (a) Amount

$= 30000 \times \frac{11}{10} \times \frac{6}{5} \times \frac{13}{10} = ₹51480$

Interest = 51480 – 30000 = ₹21480

28. (a) Vipul, $20\% = \frac{1}{5}$

P : A
5 : 6
5 : 6
5 : 6
125 : 216

$$\begin{tikzcd} 125 \arrow[r, bend right, "CI"'] \arrow[d, "\times 120"'] & 216 \\ 15000 & 91 \rightarrow 10920 \end{tikzcd}$$

Manish $30\% = \frac{3}{10}$

P : A
10 : 13
10 : 13
10 : 13
1000 : 2197

$$\begin{tikzcd} 1000 \arrow[r, bend right, "CI"'] \arrow[d, "\times 20"'] & 2197 \\ 20000 & 1197 \rightarrow 23940 \end{tikzcd}$$

∴ Total CI = 10920 + 23940 = 34860

29. (a) Time = 1.5 years = 3 half years,
Rate = 10% (yearly) = 5 % (half yearly)
Effective rate of CI = 15.7625%
Effective rate of SI = 3 × 5 = 15%
Diff. % = 0.7625%

$\text{Difference} = 72000 \times \frac{0.7625}{100} = ₹549$

30. (a) Equivalent rate of CI at 20% for 2 cycle = 44%
We have, (100 + 44)% = ₹7776
Also,
Equivalent rate of CI at 10% for 3 cycles = 33.1%

$\therefore \text{Required Amount} = \frac{7776}{144} \times 133.1$
= ₹7187

31. (c) $\text{Amount} = 15000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)$

$= 15000 \times \frac{104}{100} \times \frac{105}{100} \times \frac{106}{100} = 17362.8$

CI = 17362.8 – 15000 = 2362.8

Alternate Method:

Effective rate of 4% and 5% = 9.2%
Effective rate of 9.2% and 6%

$= \left(9.2 + 6 + \frac{9.2 \times 6}{100}\right)\% = 15.752\%$

CI = 15.752% of 15000 = 2362.8

32. (d) Principal = 7500
Rate of interest: 20%, 20%, 10%, 10%

P A
1st year → 5 : 6
2nd year → 5 : 6
3rd year → 10 : 11
4th year → 10 : 11
2500 : 4356

$$\begin{tikzcd} 2500 \arrow[r, bend right] \arrow[d, "\times 3"'] & 4356 \\ ₹7500 & 1856\text{ unit} \xrightarrow{\times 3} ₹5568 \end{tikzcd}$$

33. (d) R × T = SI ⇒ r × 4% = 40%
⇒ r = 10%
Effective rate of CI for 4 years

$= 33.1 + 10 + \frac{33.1 \times 10}{100} = 46.41\%$

$\text{CI of 4 years} = 80000 \times \frac{46.41}{100}$
= 37128

34. (a)

P A
20 : 21
20 : 21
20 : 21
20 : 21
160000 : 194481

160000 unit = 6500
194481 unit = 7900

Alternate Method:

For 4 Years		CI
4	$6500 \times \frac{5}{100} = 325$	1300
6	$325 \times \frac{5}{100} = 16.25$	97.5
4	$16.25 \times \frac{5}{100} = 0.8125$	3.25
1		
		~1400

Amount = 6500 + 1400 = 7900

35. (d) Principal = 5000
Effective rate at 10% per year compounded semi annually for 2 yrs = 21.55%
Amount = (100 + 21.55)% = 121.55%

$\Rightarrow \frac{5000}{100} \times 121.55 \sim ₹6078$

36. (a) Rate = 10%,
For 2 years ↓ 21%
For 4 years ↓ 46.41%

$21\% \xrightarrow{\text{diff.}} 46.41\%$

25.41% → 5082
100% → 20,000

37. (c) $SI = \frac{160000 \times 10 \times 2}{100} = 32000$

$CI = 160000\left(1+\frac{5}{100}\right)^4 - 160000$

= 194481 − 160000 = 34481
Amount earned by A in whole transaction = 34481 − 32000 = 2481

Alternate Method:
Overall interest when compounded semi-annually for 2 years = 21.55%
Overall SI = 2 × 10 = 20%
difference = 21.55 − 20 = 1.55%
Amount earned by A in the whole transaction

$= \frac{1.55}{100} \times 160000 = 155 \times 16 \sim 2481$

38. (a) $\text{Principal} = \left(\frac{10}{11}\right)^5 \times 161051$

$= \frac{100000}{161051} \times 161051 = 100000$

Amount after 3 years

$= \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times 100000 = ₹133100$

39. (b)

Peter	Rachel
Sum = P	Sum = $\frac{P}{2}$
R = 10%	R = 10%
S.I	C.I
t = 2yrs.	t = 3yrs

ATQ,

$I = \frac{20}{100} \times P \qquad I = \frac{33.1}{100} \times \frac{P}{2}$

Then, Difference $= \frac{20P}{100} - \frac{33.1P}{200} = 897$

$\Rightarrow 40P - 33.1P = 897 \times 200$
$\Rightarrow 6.9\,P = 897 \times 200 \Rightarrow P = 26000$

$\therefore$ Sum of Rachel $= \frac{P}{2} = ₹13000$

40. (d) Rate of interest for the first cycle (12 months) = 10%
Rate of interest for the second cycle

$(9 \text{ months}) = \frac{10}{12} \times 9 = \frac{15}{2}\%$

Equivalent rate of CI at 10% & $\frac{15}{2}\%$ for 2 cycle. $= 10 + \frac{15}{2} + \frac{10}{100} \times \frac{15}{2}$

$= 10 + \frac{15}{2} + \frac{3}{4} = \frac{73}{4}\%$

We have, $\frac{73}{4}\% = ₹1460$
$\therefore$ 1% = ₹80
⇒ Principal (100%) = ₹8000

Alternate Method:

	P		A
1st cycle →	10	:	11
2nd cycle →	40	:	43
	400	:	473

$400 \xrightarrow{\text{CI}} 473$

73units $\xrightarrow{\times 20}$ ₹1460

$400 \xrightarrow{\times 20}$ ₹8000

41. (c) $\text{Rate} = \frac{15}{12} \times 5\% = \frac{25}{4}\% = \frac{1}{16}$

$\text{Time} = 1\frac{1}{4} = \frac{5}{4} \times 12 = 15 \text{ months}$
= 3 cycle

	P		A
1st cycle →	16	:	17
2nd cycle →	16	:	17
3rd cycle →	16	:	17
	4096	:	4913

$4096 \rightarrow 4913$

817unit $\xrightarrow{\times 2}$ ₹1634

$4096 \xrightarrow{\times 2}$ ₹8192

42. (a) Equivalent rate of compound interest at 14% for 2 years

$= \left(14 + 14 + \frac{14 \times 14}{100}\right)\% = 29.96\%$

Rate of interest for third year

$= \frac{5}{7} \times 14 = 10\%$

Equivalent rate of CI at 29.96% & 10% for 2 cycles

$= \left(29.96 + 10 + \frac{29.96 \times 10}{100}\right)\%$

= 42.956%

$\therefore CI = 10{,}000 \times \frac{42.956}{100} = ₹4295.6$

Alternate Method:

	P		A
1st year →	50	:	57
2nd year →	50	:	57
3rd year →	10	:	11
	25000	:	35739

$25000 \rightarrow 35739$

10739 unit $\xrightarrow{\times 0.4}$ ₹4295.6

$25000 \xrightarrow{\times 0.4}$ ₹10000

43. (a)

P		A
10	:	11
10	:	11
10	:	11
25	:	26
25000	:	34606

$25000 \xrightarrow{\text{CI}} 34606$

9606 unit $\xrightarrow{\times 1}$ 9606

$25000 \xrightarrow{\times 1} 25000$

$\therefore$ CI = ₹9606

44. (c)
I year ← P → II year
SI 250 + 250 → 500
250 → 50

Total CI = 550

$R = \frac{50}{250} \times 100 = 20\%$

45. (c) Difference of CI and SI for 2 years

$= P\left(\frac{R}{100}\right)^2 \Rightarrow 162 = P\left(\frac{9}{100}\right)^2$

$\Rightarrow P = \frac{162 \times 10000}{81} = ₹20000$

46. (d) Diff of CI and SI for 2 years

$= P\left(\frac{25}{100}\right)^2 \Rightarrow 1725 = P\left(\frac{25}{100}\right)^2$

⇒ P = 27600

47. (c) Firstly, we will find the principal.
We know that,

$\text{Difference} = P\left(\frac{R}{100}\right)^2$

$\Rightarrow 1944 = P\left(\frac{15}{100}\right)^2$

$\Rightarrow P = \frac{1944 \times 100 \times 100}{15 \times 15} = 86400$

Now, P = 86400, R = 10%,
T = 2 Years
Effective rate at 10% for 2 yrs = 21%
CI = 86400 × 21% = 18144
Note:- No need to multiply it, do it with help of unit digit.

Alternate Method:
Rate = 15% per annum

Rate of CI for 2 years	Rate of SI for 2 years
32.25%	30%

$32.25\% \xrightarrow{2.25\%} 30\%$

2.25% ↓ 1944

Eff. rate of 10% CI for 2 years = 21%
2.25% → 1944

$21\% \rightarrow \frac{1944}{2.25} \times 21 = ₹18144$

48. (b) Difference of CI and SI for 2 years

$= 156250 \times \left(\frac{8}{100}\right)^2$

= ₹1000

49. (d) Diff. b/w CI and SI for 2 years

$= P \times \left(\frac{r}{100}\right)^2 = 10{,}000 \times \left(\frac{15}{100}\right)^2$

$= 10{,}000 \times \frac{225}{10{,}000}$

= ₹225

50. (d) Difference between the CI & SI for 2 yrs. $= P \times \left(\frac{R}{100}\right)^2$

$\Rightarrow 200 = P \times \left(\frac{10}{100}\right)^2$

⇒ P = ₹20000

Alternate Method:
Equivalent rate of CI at 10% for 2 cycle $= \left(10 + 10 + \frac{10 \times 10}{100}\right)\% = 21\%$

SI at 10% for 2 year = 20%
Difference between CI & SI
= 21 − 20 = 1%
We have, 1% = 200

$\therefore P = \frac{200}{1} \times 100$

= ₹20000

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51. (c) Difference between the CI & SI

for 3 yrs. $= P\left(\frac{r}{100}\right)^2\left(3+\frac{r}{100}\right)$

$\Rightarrow 76 = P\left(\frac{4}{100}\right)^2\left(3+\frac{4}{100}\right) \Rightarrow P = 15625$

Note:-
Equivalent rate of CI at 4% for 3 cycle = 12.4864 (by successive % formula) Equivalent rate of SI at 4% for 3 cycle = 12%
Difference between CI & SI
= 12.4864 − 12 = 0.4864%
We have,
0.4864% = ₹76

$\therefore P = \frac{76}{0.4864} \times 100 = ₹15625$

52. (a) Difference between CI & SI for

3 years $= P\left(\frac{r}{100}\right)^2\left(3+\frac{r}{100}\right)$

$= 15625\left(\frac{4}{100}\right)^2\left(3+\frac{4}{100}\right)$

$= 15625 \times \frac{16}{10000} \times \frac{304}{100} = ₹76$

Alternate Method:
To avoid the calculation using digital sum method:

$$\begin{tikzcd}[column sep=small] \Rightarrow 15625 \arrow[d] & \times & \frac{16}{10000} \arrow[dd] & \times & \frac{304}{100} \arrow[dd] \\ \Rightarrow 10 \arrow[d] & & & & \\ 1 & \times & 7 & \times & 7 = 49 \Rightarrow 4 \end{tikzcd}$$

Now,
Check option (a) 76,
⇒ 7 + 6 = 13 = 4 (digital sum)

53. (a) SI Rate for 3 years = 5 × 3 = 15%
CI Rate 3 years = 15.7625%
∴ Difference = 0.7625%
sum of money (100)%

$= \frac{15.25}{0.7625} \times 100 = ₹2000$

54. (b) Difference between SI and CI for 3 years

$= P\left(\frac{r}{100}\right)^2\left(3+\frac{r}{100}\right)$

$= 6500\left(\frac{7}{100}\right)^2\left(3+\frac{7}{100}\right)$

$= 6500 \times \frac{49}{10000} \times \frac{307}{100} = 97.78$

55. (d) Diff. of CI and SI for 3 years

$= P\left(\frac{R}{100}\right)^2\left(\frac{300+R}{100}\right)$

$= 5000\left(\frac{8}{100}\right)^2\left(\frac{300+8}{100}\right) \sim 99$

56. (b) P = 6000, R = 10%, T = 2 yrs

I. SI $= 6000 \times \frac{10 \times 2}{100} = 1200$

II. Effective rate at 10% CI for two years = 21%

$CI = \frac{6000}{100} \times 21$

= 1260
Both statements are correct.

57. (b) $SI = \frac{P \times R \times T}{100}$

$\Rightarrow 4800 = \frac{P \times 12 \times 8}{100}$

$\Rightarrow P = \frac{480000}{96} = ₹5000$

Effective rate at 10% for 3 years = 33.1%

$CI = 5000 \times \frac{33.1}{100} = 1655$

SMART APPROACH:-
R = 12% Time = 8 year
∴ Total Interest = 96%

$$96\% \xrightarrow{\times 50} \text{Rs. } 4800$$

∴ Sum = 100 × 50 = Rs. 5000
We know If Rate 10%
T = 3 year Then effective rate = 33.1%
∴ C.I of 3 year = 5000 × 33.1%
= Rs. 1655

58. (b) Effective rate

$= \left(60+60+\frac{60 \times 60}{100}\right)\% = 156\%$

⇒ 156% = ₹6240

$P = 100\% = \frac{6240}{156} \times 100 = ₹4000$

$S.I. = \frac{P \times R \times T}{100} = \frac{4000 \times 60 \times 3}{100}$

= ₹7200

59. (d) yearly = 10%, and

half-yearly $= \frac{10}{2} = 5\%$

5% CI at half-yearly

$= \left(5+5+\frac{5 \times 5}{100}\right)\% = 10.25\%$

Difference = 10.25% − 10% = 0.25%
0.25% = ₹88.80
100% = ₹35520

$SI = \frac{35520 \times 10 \times 5}{300} = 5920$

60. (c) CI for 4 years at 10% = 46.41%
Amount = 146.41%
⇒ 146.41% = 14641
1% = 100
Principal 100% = ₹10000
Now, amount on SI

$= 10000 + 10000 \times \frac{17}{5} \times \frac{10}{100}$

= 10000 + 3400
= ₹13400

61. (c) SI for 4 years at 15% = 60%
Amount = 160%
160% → ₹11520
1% → 72
Principal (100%) = 7200
If interest is compounded 8 monthly

$\text{Rate} = \frac{15}{12} \times 8 = 10\%$

Effective rate at 10% for 3 cycles = 33.1%
Amount = 133.1%

$\Rightarrow \frac{133.1}{100} \times 7200 \sim 9583$

62. (d) For first year rate = 10%

For 9 months rate $= 10 \times \frac{9}{12} = \frac{15}{2}\%$

Effective rate $= \left(10+\frac{15}{2}+\frac{10 \times \frac{15}{2}}{100}\right)\%$

$= 17.5 + \frac{150}{200} = \frac{73}{4}\%$

$\frac{73}{4}\% \rightarrow 1460$
1% → 80
100% → ₹8000

Alternate Method:

$$\begin{array}{lccc} & P & & A \\ \text{I}^{st}\text{ year} \rightarrow & 10 & : & 11 \\ \text{II}^{nd}\text{ year} \rightarrow & 40 & : & 43 \\ \hline & 400 & : & 473 \end{array}$$

$$\begin{tikzcd} 400 \arrow[d, "\times 20"'] \arrow[r, bend right, "CI"'] & 473 \\ \boxed{\text{Rs.}8000} & 73\text{ unit} \xrightarrow{\times 20} 1460 \end{tikzcd}$$

63. (b) Eff. rate for Varun = 22%
Eff. rate for Madhur = 21%
Varun received more interest
= (22 − 21)% = 1% extra

$\Rightarrow \frac{1}{100} \times 25000 = 250$

64. (c) $1200 = \frac{P \times 8 \times 3}{100} \Rightarrow P = 5000$

New principal = 2 × 5000 = 10000
Equivalent rate of CI at 10% for 2 yrs.
= 21%

$\therefore CI = 10000 \times \frac{21}{100} = 2100$

65. (b) Rate $= \frac{8}{2} = 4\%$

Equivalent rate of CI at 4% for 2 cycle

$= \left(4+4+\frac{4 \times 4}{100}\right)\% = 8.16\%$

∴ Profit = (8.16 − 4)% = 4.16%

Principal $= \frac{166.4}{4.16} \times 100 = ₹4000$

66. (b) SI for 4 years = 40%
Effective rate at 10% for 4 years
= 46.41%
∴ 40% = 3200 1% = 80
146.41% = ₹11712.8
Amount = ₹11712.8

67. (a) SI for 2 years at 10% = 20%
CI for 2 years at 15% = 32.25%

$CI = \frac{8100}{20} \times 32.25$

= ₹13061.25 ~ 13061

68. (c) Principal = ₹8000
S.I for 3yrs. = 3600
S.I for 1 yrs = 1200

$\text{Rate} = \frac{1200}{8000} \times 100 = 15\%$

When interest is compounded 8-monthly

$\text{Rate} = \frac{15}{12} \times 8 = 10\%$

Eff. rate = 33.1%

$\text{Amount} = \frac{133.1}{100} \times 8000 = 10,648$

Note:- No need to multiply do it with the help of unit digit

69. (b) Eff. rate on S.I = 3 × 12 = 36%

In Second case:-

Time = 4 half years

$\text{Rate} = \frac{20}{2} = 10\% \Rightarrow \text{Eff. rate} = 46.41\%$

Now, 36% → 6750

$46.41\% \rightarrow \frac{6750}{36} \times 46.41 \sim 8702$

70. (a) A = 15,500, T = 2 years

R = 12%

Effective rate of SI for 2 years = 24%

Now, $T = 1\frac{1}{2}$ year, R = 10%

(Compounded half - yearly)

$R = \frac{10}{12} \times 6 = 5\%, \; T = \frac{18}{6} = 3 \text{ cycles}$

Effective rate of CI at 5% for 3 cycles = 15.7625%

$\text{Amount} = \frac{15{,}500}{124} \times 115.7625$

= 14,470

71. (c) SI for 1 year $= \frac{11250}{3} = 3750$

So, SI for 2 years = 2 × 3750 = ₹7500

CI for 2 year = 7650

Difference = 7650 − 7500 = ₹150

$\text{Rate} = \frac{150}{3750} \times 100 = 4\%$

$\text{Principal} = \frac{11250}{12} \times 100 = ₹93750$

72. (b)

P A

3125 3515.20

Simplified form 15625 : 17576) Cube root

25 : 26

$\text{Rate} = \frac{1}{25} \times 100 = 4\%$

New rate = 4 + 2 = 6%

$SI = \frac{3125 \times 6 \times 3}{100} = 562.5$

73. (c) P A

6400 : 7744

For 2 years, take square root

80 : 88

$\text{Rate of interest} = \frac{8}{80} \times 100 = 10\%$

74. (b) P A

8000 : 9261

For 3 cycles, take cube root

20 : 21

$\text{Rate of interest} = \frac{1}{20} \times 100 = 5\%$

Annual rate of interest = 10%

75. (c) P A

1 1.96

Simplified form 25 : 49) Square root

5 : 7

$\text{Rate} = \frac{2}{5} \times 100 = 40\%$

76. (d) $\sqrt{14400} : \sqrt{15876}$

120 : 126

$r = \frac{6}{120} \times 100 = 5\%$ (half yearly rate)

∴ Original rate% = 5 × 2 = 10%

77. (a)P = 1728, A = 4096

P : A

(1728 : 4096)) Cube root

12 : 16

$R = \frac{4}{12} \times 100 = 33\frac{1}{3}\%$

78. (a) If the rate is compounded half yearly, then the time period will be 3 cycles

ATQ,

$\sqrt[3]{200000} : \sqrt[3]{231525}$

$\sqrt[3]{8000} : \sqrt[3]{9261}$

20 : 21

$\text{Rate} = \frac{21-20}{20} \times 100 = 5\%$

The rate is compounded half-yearly, hence, the rate will be 10% per annum.

79. (c)

P A

9500 11495

Simplified form 100 : 121) Square root

10 : 11

$\text{Rate} = \frac{1}{10} \times 100 = 10\%$

Now, New rate = 20%

$SI = \frac{9500 \times 20 \times 2}{100} = 3800$

80. (b) Rate = 20% (yearly)

= 10% (Half yearly)

P A

18000 : 23958

Simplified form

1000 : 1331

Which is a perfect cube) Cube root

(10) : (11)

∴ Time = 3 cycle $= 1\frac{1}{2}$ years

81. (a) Rate half yearly = 10%

Amount = 10,000 + 4641 = 14641

$\because A = P\left(1 + \frac{r}{100}\right)^n$

$\Rightarrow 14{,}641 = 10000\left(\frac{11}{10}\right)^n$

$\Rightarrow \frac{14641}{10000} = \left(\frac{11}{10}\right)^n \Rightarrow \left(\frac{11}{10}\right)^4 = \left(\frac{11}{10}\right)^n$

∴ n = 4

$\text{Required time} = \frac{4}{2} = 2 \text{ years}$

SMART APPROACH:-

$\text{Half year rate} = \frac{20\%}{2} = 10\%$

P A

10000 : 14641

↓ ↓

$10^4 : 11^4$

$\therefore \text{Required years} = \frac{4}{2} = 2 \text{ yrs}$

82. (c) $\text{Rate} = \frac{15}{100} = \frac{3}{20} \overset{+}{\rightarrow} \frac{23}{20}$

P : A

160000 : 279841) 4th root

20 : 23

∴ Time = 4 years

83. (b)

$$\begin{tikzcd} P \arrow[r, "2Y"] \arrow[rr, bend left, "3Y"] & 33800 \arrow[r, "1Y"] & 43940 \end{tikzcd}$$

Simplified form

$$\begin{tikzcd} 10 \arrow[r, bend right, "\times\frac{13}{10}"'] & 13 \end{tikzcd}$$

Since in 1 year amount becomes $\frac{13}{10}$ times of itself.

$\Rightarrow P \times \frac{13}{10} \times \frac{13}{10} = 33800$

⇒ P = ₹20,000

ATQ,

When principal is doubled, the amount at the end of 2 years.

$= 40000 \times \frac{13}{10} \times \frac{13}{10}$

= ₹67600

84. (d) R = 30% p.a.

For half yearly, $R = 15\% = \frac{3}{20}$

ATQ,

$\frac{1216.70}{800} = \left(\frac{23}{20}\right)^T \Rightarrow \left(\frac{23}{20}\right)^3 = \left(\frac{23}{20}\right)^T$

⇒ T = 3 cycle = 1.5 years

85. (a) P = ₹18000

CI = ₹1260

$\Rightarrow \left(\frac{7}{100}\right)^t = \frac{1260}{18000} \Rightarrow \left(\frac{7}{100}\right)^t = \frac{7}{100}$

∴ Time period = 1 year.

86. (a) P : A

7500 : 9075

$\sqrt{100} : \sqrt{121}$

10 : 11

t = 2 years

$\therefore SI = \frac{P \times R \times T}{100} = \frac{7500 \times 10 \times 2}{100}$

= 1500

87. (c) P A

8000 9261) Cube root

20 : 21

Time = 3 half yearly $= 1\frac{1}{2}$ years

Now,

R = 10 × 2 = 20%

Effective rate of CI for $1\frac{1}{2}$ years = 32%

$CI = 8000 \times \frac{32}{100} = ₹2560$

88. (d)

$$\begin{tikzcd} P \arrow[r, "2Y"] \arrow[rr, bend left, "3Y"] & 6580 \arrow[r, "1Y"] & 7896 \end{tikzcd}$$

Interest for 1 year = (7896 − 6580)

= ₹1316

$\text{Rate of interest} = \frac{1316}{6580} \times 100 = 20\%$

89. (c)

$$\begin{tikzcd} P \arrow[r, "2Y"] \arrow[rr, bend left, "3Y"] & 1200 \arrow[r, "1Y"] & 1260 \end{tikzcd}$$

Difference in 1 year = 1260 − 1200

= ₹60

₹60 is interest on 1200

$\therefore R = \frac{60}{1200} \times 100 = 5\%$

90. (d)

3 years 2 years

P 6400 8100

5 years

So,

6400 : 8100

$(80)^2 : (90)^2$

8 : 9

Rate $= \frac{1}{8} \times 100 = 12\frac{1}{2}\%$

91. (b) $A_2 = 6120$, $A_3 = 7340$

CI in 1 year = 7340 − 6120 = 1220

Rate $= \frac{1220}{6120} \times 100 = 20\%$ (Approx)

$P \times \frac{6}{5} \times \frac{6}{5} = 6120$

$P = \frac{6120 \times 25}{36} = 4250 \approx 4254.63$

Alternate Method::

P A_1 A_2 A_3

$\frac{6120 \times 306 \times 306}{367 \times 367}$ 6120 7340

$\frac{6120}{367} \times 306$

Ratio→306 : 367

↓

4254.63

92. (d)

3 yrs. 5 yrs.

P 20736 29859.84

Simplified form 25 : 36 ⎫ Square

5 : 6 ⎭ root

$\times\frac{6}{5}$

$P \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} = 20736$

⇒ P = 96 × 125 = ₹12000

93. (b)

3 yrs. 5 yrs.

P 7800 11232

Simplified form 25 : 36 ⎫ Square

5 : 6 ⎭ root

Rate $= \frac{1}{5} \times 100 = 20\%$

94. (b)

4 yrs. 6 yrs.

P 15000 25350

Simplified form 100 : 169 ⎫ Square

10 : 13 ⎭ root

$R = \frac{3}{10} \times 100 = 30\%$

95. (a)

C_2 C_4

$(400 \quad 576)^{\frac{1}{2}}$

1 year → 20 : 24

+4

Rate $= \frac{4}{20} \times 100 = 20\%$

96. (a)

4 yrs. 5 yrs.

P 7562 8469.44

Difference = 8469.44 − 7562 = 907.44

Rate $= \frac{907.44}{7562} \times 100 = 12\% = \frac{3}{25}$

P A

25 : 28

25 : 28

625 : 784

CI

159 units $\xrightarrow{\times 16}$ 2544

↓

10000

97. (b) ATQ,

4 years 4 years 4 years

1 2 4 8

×2 ×2 ×2

Total time = 4 + 4 + 4 = 12 years

Alternate Method:

×3 (4 years → 2^1 Times) ×3

12 years → 2^3 Times

98. (c) ATQ,

5 years 5 years

1 3 9

×3 ×3

Total time = 5 + 5 = 10 years

Alternate Method:

×2 (5 years → 3^1 Times) ×2

10 years → 3^2 Times

99. (c) Let principal = P

7 year 7 year 7 year

P 2P 4P 8P

Total time = 21 years

SMART APPROACH:-

2 times ⇒ 7 years

∴ $(2)^3$ times ⇒ 7 × 3

= 21 years

100. (a) P = ₹4000, R = 10% $= \frac{1}{10}$

$\Rightarrow CI_3 - CI_2 = \left(4000 \times \frac{1}{10}\right) \times \frac{11}{10} \times \frac{1}{10}$

= ₹44

101. (d) Interest for third year

$= \left(100000 \times \frac{7}{100}\right) \times \frac{107}{100} \times \frac{107}{100} = 8014.3$

SMART APPROACH:-

A.T.Q.

Interest received in third year

$= \left(100000 \times \frac{7}{100}\right) \times \frac{107}{100} \times \frac{107}{100}$

$= \frac{7 \times 107 \times 107}{10}$

When this number is divided by 10, the decimal will be placed after one digit. Hence, in option (d) only, the decimal has been placed after one digit.

102. (d) Given that a sum of money becomes 2 times of itself in 8 yrs. at simple interest

$\Rightarrow \frac{P \times R_1 \times 8}{100} = P$

$\Rightarrow R_1 = \frac{100}{8}\%$

At compound interest, the sum becomes four times of itself in 2 yrs.

	P	A
For 2 year →	1	4
For 1 year →	1 :	2

+1

$R_2 = \frac{1}{1} \times 100\% = 100\%$

Ratio $= \frac{100}{8} : 100 = 1 : 8$

103. (d) **Case I:** Rate is compounded annually

R = 20% & T

= 1.5 years

Rate of interest for the first cycle (12 months) = 20%

Rate of interest for the second cycle

(6 months) $= \frac{20}{12} \times 6 = 10\%$

Equivalent rate of CI at 20% & 10% for 2 cycle = 32%

Case II: Rate is compounded half yearly

R = 10% & T = 3 cycle

Equivalent rate of CI at 10% for 3 cycle = 33.1%

∴ Difference in C.I.

= 33.1 − 32 = 1.1%

We have, 1.1% = 1716

$\therefore P = \frac{1716}{11} \times 1000$

= 1,56,000

104. (d) Principal = ₹100000

Rate = 7% $= \frac{7}{100}$

Amount after 5 years

$= 100000 \times \left(\frac{107}{100}\right)^5$

= 40255.1731 ≈ 40255

Alternate Method:

For 5 Years		CI
5	$100000 \times \frac{7}{100} = 7000$	35000
10	$7000 \times \frac{7}{100} = 490$	4900
10	$490 \times \frac{7}{100} = 34.3$	343
5	$34.3 \times \frac{7}{100} = 2.401$	12
1	$2.401 \times \frac{7}{100} = 0.168$	~ 0.1
		40255

105. (c) Rate = 16% (yearly) = 4% (quarterly),

Time = 1 year = 4 quarters

$\text{Amount} = P\left(1 + \frac{R}{100}\right)^n$

$= 75000\left(1 + \frac{4}{100}\right)^4$

$= \frac{75000 \times 26 \times 26 \times 26 \times 26}{25 \times 25 \times 25 \times 25}$

~ ₹87739.40

Alternate Method:

For 4 Years		CI
4	$75000 \times \frac{4}{100} = 3000$	12000
6	$3000 \times \frac{4}{100} = 120$	720
4	$120 \times \frac{4}{100} = 4.8$	19.2
1	$4.8 \times \frac{4}{100} = 0.192$	~ 0.2
		12739.4

Total amount = 75000 + 12739.4

= 87739.4

106. (c) $10 = x + x + \frac{x^2}{100}$

$\Rightarrow 2x + \frac{x^2}{100} = 10$

By option (a), (b)
Because both $2x$ = more than 10
(c) If 4.88
= 4.88 + 4.88 + .2381
= 9.76 + .2381
= 9.9981 ~ 10

(d) $\left(4.55 + 4.55 + \frac{4.55 \times 4.55}{100}\right)\%$

= 9.307025
Hence option 'c' is correct.

107. (b) Eff. rate on S.I = 20%
Eff. rate on C.I = 21%
Let, x = P on S.I, y = P on C.I
ATQ,

$\frac{x \times 120}{100} = \frac{y \times 121}{100} \Rightarrow x : y = 121 : 120$

241 unit → 12050

120 unit → $\frac{12050}{241} \times 120$ = ₹6000

108. (d) $A\left(1+\frac{7}{100}\right)^3 = B\left(1+\frac{7}{100}\right)^4$

$\Rightarrow \frac{A}{B} = \left(1+\frac{7}{100}\right)$

$\Rightarrow \frac{A}{B} = \frac{107}{100}$

(107 + 100) units = 51750
107 unit = 26750

SMART APPROACH:-

R = 7% = $\frac{7}{100}$

B A

100^1 107^1 [Power = time diff]

100 107

$\underbrace{100 + 107}$

207 unit $\xrightarrow{\times 250}$ 51750

A = 107 unit $\xrightarrow{\times 250}$ Rs.26750

109. (a) **Case I:** Equivalent rate of CI for $1\frac{1}{2}$ years = $\frac{3840}{12000} \times 100 = 32\%$

⇒ Equivalent rate of CI for 1 year = 20%
(∵ 20% for the whole year & 10% for the half year will be equivalent to 32%)

Case II: P = 12,000,
R = 20% p.a. = 10% half yearly,

T = $1\frac{1}{2}$ years = 3 cycles

Equivalent rate of CI at 10% for 3 cycle = 33.1%

∴ Required CI = 12000 × $\frac{33.1}{100}$
= ₹3972

110. (d) $P_1\left(1+\frac{R}{100}\right)^3 = P_2\left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{P_1}{P_2} = \frac{1}{\left(1+\frac{R}{100}\right)} = \frac{1}{\left(1+\frac{10}{100}\right)} \Rightarrow \frac{P_1}{P_2} = \frac{10}{11}$

We have, $P_1 + P_2$ = 21 units
= ₹52500

∴ $P_1 = \frac{52500}{21} \times 10$ = ₹25000

SMART APPROACH:-

R = 10% = $\frac{1}{10}$

Younger Elder

10^1 11^1 [Power = age diff]

$\underbrace{10 + 11}$

(10+11) = 21 unit $\xrightarrow{2500}$ 52500

Younger = 10 × $\xrightarrow{2500}$ 25000

111. (b) $A\left(1+\frac{10}{100}\right)^8 = B\left(1+\frac{10}{100}\right)^{10}$

$\Rightarrow \frac{A}{B} = \left(1+\frac{10}{100}\right)^2 = \frac{121}{100}$

(121 + 100) units
= 66300

A gets (121) units = $\frac{66300}{221} \times 121$
= 36300

B gets (100) units = $\frac{66300}{221} \times 100$
= 30000

SMART APPROACH:-

R = 10% = $\frac{1}{10}$

A B

11^2 10^2 [Power = age diff]

121 100

$\underbrace{121 + 100}$

221 unit $\xrightarrow{\times 300}$ 66300

A = 121 unit $\xrightarrow{\times 300}$ Rs.36300

B = 100 unit $\xrightarrow{\times 300}$ Rs.30000

112. (b) **Scheme A:** Let, P = 200 units
R = 20% p.a. = 10% half yearly

T = $1\frac{1}{2}$ years = 3 cycles

Equivalent rate of CI at 10% for 3 cycle = 33.1%

∴ CI = 200 × $\frac{33.1}{100}$ = 66.2 units

Scheme B: Let, P = 300 units

R = 10% p.a. & T = $\frac{3}{2}$ years

Equivalent rate of CI at 10% & 5% for 2 cycle = 15.5%

∴ CI = 300 × $\frac{15.5}{100}$ = 46.5 units

We have, (66.2 + 46.5) units
= ₹13524
∴ Amount invested in scheme A

= $\frac{13524}{112.7} \times 200$ = ₹24000

113. (c)

	P		A
I^{st} year → 80% (+) →	5	:	9
IInd year → 60% (+) →	5	:	8
IIIrd year → 40% (–) →	5	:	3
	125	:	216

Cumulative rate of interest = $\frac{91}{125} \times 100$ = 72.8%
We know that when we take 20% interest for 3 year, its cumulative rate of interest is 72.8%.
So, overall rate of interest for 3 years = 20%

114. (b) R = 10% = $\frac{1}{10}$

P I

$10_{\times 11}$: $11_{\times 11}$

100 : 121 $\xrightarrow{\times 57}$ ₹6897

210 : 242

$\overset{CI}{\frown}$

32 units

↓

₹1824

115. (b) r = $\frac{8\%}{2}$ = 4% = $\frac{1}{25}$

$\boxed{P}$: $\boxed{A}$

I^{st} year → $(25 : 26)_{\times 26}$

IInd year → 625 : 676

1275 : 1352

$\downarrow \times 2$ $\times 2$

2550 1352

Annual installment is ₹1352

116. (d) We know that installment is equal in each year.

R → 10% = $\frac{1}{10}$

P I

$10_{\times 121}$: $11_{\times 121}$

$100_{\times 11}$: $121_{\times 11}$

1000 : 1331

3310 : 3993

$\times 3 \downarrow$ $\times 3$

9930 3993

117. (b) Rate = 8%

half yearly = $\frac{8}{2}$ = 4% = $\frac{1}{25}$

P I

$25_{\times 26}$: $26_{\times 26}$

625 : 676

1275 : 1352

$\times 7 \downarrow$

8925 4732

118. (a) 10% = $\frac{1}{10}$

P I

$10_{\times 11}$: $11_{\times 11}$

100 : 121

210 : 242

$\overset{CI}{\frown}$

32 unit $\times 54$

↓ 6534

₹1728

119. (d) R = 8%

Half year rate = 4% = $\frac{1}{25}$

P Inst.

(25 $26)_{\times 26}$

625 676

1275 1352

$\overset{CI}{\frown}$ $\times 10$

77

$\downarrow \times 10$ ₹6760

$\boxed{₹770}$

120. (d) 10% = $\frac{1}{10}$

P I

$10_{\times 11}$: $11_{\times 11}$

100 : 121

210 : 242

$\overset{CI}{\frown}$

32 unit $\times 48$

↓ 5808

₹1536

60% of total interest = $1536 \times \frac{3}{5}$

$= 921.6 \sim 922$

121. (b) Rate = $7\frac{1}{2}\% = \frac{15}{200} = \frac{3}{40}$

$$\begin{array}{lcc} & P & \text{Inst.} \\ \text{Ist year} & (40 & 43)_{\times 43} \\ \text{IInd year} & 1600 & 1849 \\ \hline & 3320 & 3698 \end{array}$$

CI = 378 $\xrightarrow{\times 3}$ $\boxed{₹1134}$

3698 $\xrightarrow{\times 3}$ ₹5547

122. (b) $2\% = \frac{1}{50}$

$$\begin{array}{ccc} P & & I \\ 50_{\times 51} & : & 51_{\times 51} \\ 2500 & : & 2601 \\ \hline 5050 & : & 5202 \\ \downarrow & & \downarrow \\ 6000 & & 3090.30 \end{array}$$

123. (a) $10\% = \frac{+1}{10}$

$$\begin{array}{lcc} & \text{Principal} & \text{Instalment} \\ \text{I}_{\text{st}}\text{ year} \rightarrow & (10 & 11)_{\times 11} \\ \text{II}_{\text{nd}}\text{ year} \rightarrow & 100 & 121 \\ \hline & 210 & 242 \\ & \downarrow \times 166.67 & \downarrow \times 166.67 \\ & 35{,}000 & 20{,}167 \end{array}$$

The value of each instalment is ₹20167.

124. (c) P = 1500, R = 40% = $\frac{2}{5}$

$$\begin{array}{ccc} P & & I \\ 5_{\times 7} & : & 7_{\times 7} \\ 25 & : & 49 \\ \hline 60 & : & 98 \\ \downarrow \times 25 & & \downarrow \times 25 \\ ₹1500 & & ₹1225 \end{array}$$

125. (b) R = 10% = $\frac{1}{10}$

Due debt = 79860 – 60000 = ₹19860

$$\begin{array}{ccc} P & & I \\ 10_{\times 121} & : & 11_{\times 121} \\ 100_{\times 11} & : & 121_{\times 11} \\ 1000 & : & 1331 \\ \hline 3310 & : & 3993 \\ \downarrow \times 6 & & \downarrow \times 6 \\ 19860 & & 7986 \end{array}$$

SMART APPROACH:-

No need to multiply 1331 by 6. It can be done with the help of unit digit.

126. (b) A.T.Q,

His income diminishes by ₹750

⇒ 3% = ₹750 ⇒ 1% = ₹250

∴ Income (100%) = ₹25000

127. (b) R = 5% = $\frac{1}{20} \xrightarrow{+} \frac{21}{20}$

$$\begin{array}{ccc} P & & A \\ 20 & : & 21 \\ 20 & : & 21 \\ 20 & : & 21 \\ \hline 8000 & : & 9261 \\ \downarrow & & \downarrow \times 3 \\ 24000 & & 27783 \end{array}$$

128. (a) The amount he owes at the end of 3rd year

$= \left[\left(50000 \times \frac{11}{10} - 15000\right) \times \frac{11}{10} - 15000\right]$

$\times \frac{11}{10} - 15000$

$= \left[40000 \times \frac{11}{10} - 15000\right] \times \frac{11}{10} - 15000$

$= 29000 \times \frac{11}{10} - 15000$

= 31900 – 15000

= ₹16900

129. (c) Given, principal = ₹8000

Amount left after Ist year = 8000 × (1.1) – 2800 = ₹6000

Amount left after IInd year = 6000 × (1.1) – 2600 = ₹4000

Amount paid at the end of 4th year = 4000 × (1.21) = ₹4840

Alternate Method:

Amount left after 2 years

$= \left(8000 \times \frac{11}{10} - 2800\right) \times \frac{11}{10} - 2600$

$= 6000 \times \frac{11}{10} - 2600 = 4000$

Amount paid at the end of 4th year

$= 4000 \times \frac{11}{10} \times \frac{11}{10} = 4840$

130. (d) $\left[(\text{sum}) \times \frac{110}{100} - 4000\right] \times \frac{110}{100} - 7700 = 0$

$\Rightarrow \text{Sum} \times \frac{11}{10} - 4000 = 7000$

$\Rightarrow \text{Sum} \times \frac{11}{10} = 11000$

⇒ Sum = 10000

131. (c)

$\left[30800 \times \frac{110}{100} \times \frac{110}{100} - 13268\right] \times \frac{110}{100} - x = 0$

$\Rightarrow [37268 - 13268] \times \frac{11}{10} = x$

$\Rightarrow 24000 \times \frac{11}{10} = x \Rightarrow x = 26400$

132. (a) Equivalent rate of CI at 10% for 2 years = 21%

Equivalent rate of CI at 10% for 4 years = 46.41%

Difference between 4 years and 2 years rate

= (46.41% – 21%) = 25.41%

We have, 25.41% = ₹5082

$\therefore P = \frac{5082}{25.41} \times 100$

= ₹20,000

SELECTION मंत्र #02

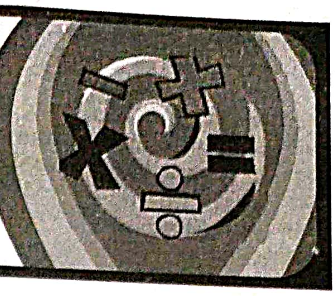
"I know the concept, but still, I can't solve questions in Mocks/Exams!"

#Hacks:-

- **Lack of Practice** – Solve **more mixed questions** to strengthen concept application.
- **Make an Error Notebook** – Write down questions you got wrong in every mock test and **revise the concept before your next test**.
- **Learn the right way to approach questions** – While solving questions from this book, **refer to the solutions, compare your approach, and adopt the best & smartest methods.**
- **Master key techniques** – Learn **Digital Sum, Prime Number Divisibility, Unit Digit, and Approximation tricks** to solve questions faster.

06 Chapter

RATIO



◆ TYPE – I ◆
BASIC QUESTIONS

1. The ratio of red to green sweets in a bag is 3 : 4. How many red sweets are there in the bag if the number of green sweets is 120?
SSC CHSL 11/07/2024 (Shift-01)
(a) 90 (b) 80
(c) 100 (d) 70

2. Two numbers are in the ratio 2 : 3. Their sum is 135. Find the numbers.
SSC CHSL 08/07/2024 (Shift-02)
(a) 45, 90 (b) 60, 75
(c) 54, 81 (d) 50, 85

3. Two quantities are in the ratio 3 : 5. If the first quantity is 155 kg. Find the other quantity (approximately).
SSC CHSL 02/07/2024 (Shift-03)
(a) 150.5 kg (b) 240.6 kg
(c) 258.3 kg (d) 200.4 kg

4. In a bag, black tablet covers and white tablet covers are in the ratio 5 : 9. If there are 450 white tablet covers, how many black tablet covers are there in the bag?
SSC CHSL 30/05/2022 (Shift-01)
(a) 200 (b) 275
(c) 225 (d) 250

5. The ratio of two numbers is 2 : 5 and their difference is 210. The smaller number is _______.
SSC CGL 24/09/2024 (Shift-03)
(a) 60 (b) 150
(c) 140 (d) 350

6. The difference between two numbers is 48. The ratio of these two numbers is 7 : 3. What is the sum of the two numbers?
SSC CHSL 01/07/2024 (Shift-04)
(a) 100 (b) 90
(c) 110 (d) 120

7. The prices of a school bag and a school dress are in the ratio of 8 : 7. The price of the school bag is ₹400 more than the price of the school dress. Find the price of the school dress.
SSC Phase XII 25/06/2024 (Shift-04)
(a) ₹3400 (b) ₹2800
(c) ₹3800 (d) ₹2400

8. Two numbers are in the ratio 5:3 and the difference between these two numbers is 34. Find the smaller of the two numbers.
SSC CPO 03/10/2023 (Shift-01)
(a) 68 (b) 34
(c) 51 (d) 85

9. A box filled with gift articles weight 25 kg. If the weight of the box and the gift articles, respectively, are in the ratio 1 : 9, then the weight of the articles (in grams) is:
SSC CHSL 04/07/2024 (Shift-01)
(a) 24500 (b) 23500
(c) 21500 (d) 22500

10. The strength of a school is 640, with the number of boys being 400. Find the ratio of girls to boys.
SSC CHSL 09/07/2024 (Shift-04)
(a) 5 : 6 (b) 3 : 5
(c) 8 : 5 (d) 4 : 5

11. If $x : y = 5 : 6$ then $2x + 3y : 3x + 5y$ is:
SSC CHSL 10/07/2024 (Shift-02)
(a) 18 : 45 (b) 18 : 35
(c) 28 : 48 (d) 28 : 45

12. If $x : y = 1 : 2$, find the value of $(2x + 4y) : (x + 4y)$.
SSC CHSL 26/05/2022 (Shift-02)
(a) 10 : 9 (b) 8 : 7
(c) 5 : 4 (d) 9 : 8

13. If a : b = 5 : 7, then $(6a^2 - 2b^2) : (b^2 - a^2)$ will be:
SSC CHSL 08/08/2023 (Shift-04)
(a) 12 : 5 (b) 21 : 5
(c) 13 : 6 (d) 17 : 8

14. If $\frac{a}{b} = \frac{7}{6}$, then find the value of the expression $\frac{6a + 13b}{6a - 13b}$
SSC CGL 24/07/2023 (Shift-03)
(a) $-\frac{3}{10}$ (b) $\frac{10}{3}$
(c) $-\frac{10}{3}$ (d) $\frac{3}{10}$

15. If p : q = 5 : 2, then $p^2 - q^2 : p^2 + q^2 = ?$
SSC MTS 06/09/2023 (Shift-02)
(a) 21 : 29 (b) 4 : 3
(c) 29 : 21 (d) 3 : 4

16. If $\frac{x}{4y} = \frac{3}{4}$, then the value of $\frac{2x + 3y}{x - 2y}$ is:
SSC CPO 05/10/2023 (Shift-02)
(a) 8 (b) 6
(c) 9 (d) 7

17. If $(7x + y) : (7x - y) = 7 : 2$, then what is the value of $x : y$?
SSC MTS 19/06/2023 (Shift-03)
(a) 9 : 35 (b) 11 : 42
(c) 6 : 41 (d) 17 : 52

18. If $\frac{5x + 3y}{5x - 3y} = \frac{7}{3}$, then find $x : y$.
SSC CPO 29/06/2024 (Shift-02)
(a) 5 : 3 (b) 3 : 2
(c) 3 : 5 (d) 2 : 3

19. If $\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{5}$, then what is the value of (4p + 3r + 7t) : (4q + 3s + 7u)?
SSC CHSL 09/03/2023 (Shift-01)
(a) 4 : 11 (b) 3 : 7
(c) 2 : 5 (d) 5 : 9

20. If a : b = c : d = e : f = 5 : 7, then what is the ratio of (3a + 5c + 11e) : (3b + 5d + 11f)?
SSC CGL 26/09/2024 (Shift-02)
(a) 7 : 11 (b) 3 : 7
(c) 5 : 7 (d) 11 : 7

21. If $x : y : z = 3 : 4 : 5$, then what will be the ratio of $\left(\frac{x}{y}\right) : \left(\frac{y}{z}\right) : \left(\frac{z}{x}\right)$?
SSC CHSL 02/08/2023 (Shift-03)
(a) 49 : 37 : 100 (b) 45 : 48 : 100
(c) 41 : 37 : 100 (d) 37 : 47 : 100

22. If $\frac{1}{M} : \frac{1}{N} : \frac{1}{O} = 3 : 4 : 5$, then M : N : O is equal to:
SSC CHSL 05/07/2024 (Shift-02)
(a) 20 : 15 : 12 (b) 15 : 20 : 12
(c) 12 : 15 : 20 (d) 20 : 12 : 15

23. If A : B : C = 2 : 3 : 4, then what will be the value of $\left(\frac{A}{B}\right) : \left(\frac{B}{C}\right) : \left(\frac{C}{A}\right)$?
SSC MTS 14/06/2023 (Shift-03)
(a) 9:5:36 (b) 8:7:25
(c) 8:9:24 (d) 12:10:13

24. If C = $\frac{2}{3}$ of D and D = $\frac{3}{8}$ of E, then find the ratio of C : E.
SSC Phase-XI 27/06/2023 (Shift-01)
(a) 4 : 1 (b) 1 : 4
(c) 3 : 4 (d) 1 : 3

25. If 40% of A = 60% of B = $\frac{1}{6}$ of C, then find the ratio of A : B : C.
SSC CPO 27/06/2024 (Shift-03)
(a) 15 : 10 : 18 (b) 36 : 10 : 15
(c) 15 : 10 : 36 (d) 10 : 15 : 36

26. If 2P = 3Q = 4R = 5S, the find P : Q : R : S.
SSC Phase-XI 28/06/2023 (Shift-03)
(a) 30 : 20 : 12 : 15
(b) 12 : 20 : 30 : 15
(c) 20 : 30 : 15 : 12
(d) 30 : 20 : 15 : 12

27. If $15x = 24y = 32z$, then $x : y : z$ is equal to:
SSC MTS 05/09/2023 (Shift-01)
(a) 32 : 15 : 20 (b) 15 : 24 : 32
(c) 32 : 20 : 15 (d) 24 : 15 : 4

28. Divide some money in the ratio Ravi, Reeta and Rahul that 5 (Part of Ravi) = 3 (Part of Reeta) = 11 (Part of Rahul). The money ratio of Ravi : Reeta : Rahul is equal to:

SSC CHSL 02/07/2024 (Shift-04)

(a) 11 : 5 : 3 (b) 33 : 55 : 15
(c) 5 : 11 : 3 (d) 11 : 33 : 15

29. If A : B = 6 : 8 and B : C = 5 : 10, then A : B : C is:

SSC CGL 13/09/2024 (Shift-01)

(a) 3 : 4 : 8 (b) 1 : 3 : 4
(c) 4 : 3 : 2 (d) 1 : 2 : 4

30. If A : B = 6 : 8 and B : C = 5 : 12, then A : B : C is:

SSC CGL 10/09/2024 (Shift-02)

(a) 11 : 32 : 44 (b) 10 : 23 : 14
(c) 14 : 31 : 28 (d) 15 : 20 : 48

31. If A : B = 6 : 8 and B : C = 7 : 10, then A : B : C is:

SSC CGL 17/09/2024 (Shift-01)

(a) 21:28:40 (b) 21:23:40
(c) 23:32:40 (d) 14:31:20

32. If A : B = 6 : 8 and B : C = 7 : 12, then A : B : C is:

SSC CGL 18/09/2024 (Shift-03)

(a) 14 : 31 : 20 (b) 21 : 32 : 40
(c) 11 : 23 : 40 (d) 21 : 28 : 48

33. If A : B = 6 : 8 and B : C = 5 : 11, then A : B : C is:

SSC CGL 25/09/2024 (Shift-02)

(a) 11:23:14 (b) 14:31:25
(c) 15:32:44 (d) 15:20:44

34. If a : b = 3 : 7 and b : c = 4 : 9, then find a : b : c.

SSC CHSL 03/07/2024 (Shift-02)

(a) 12 : 28 : 63 (b) 12 : 28 : 9
(c) 3 : 28 : 9 (d) 3 : 28 : 63

35. If A : B = 3 : 7 and B : C = 2 : 5, find A : B : C.

SSC CHSL 01/07/2024 (Shift-03)

(a) 6 : 14 : 35 (b) 4 : 10 : 3
(c) 10 : 3 : 4 (d) 4 : 3 : 10

36. If A : B = 5 : 8 and B : C = 7 : 8, then find A : C.

SSC CHSL 09/07/2024 (Shift-03)

(a) 55 : 30 (b) 35 : 64
(c) 34 : 64 (d) 35 : 56

37. If a : b = 2 : 3, b : c = 5 : 7, then find the ratio c : a.

SSC CGL TIER-II (20/01/2025)

(a) 15 : 21 (b) 20 : 21
(c) 21 : 10 (d) 10 : 21

38. If p : q = 4 : 5, q : r = 3 : 4 and r : s = 2 : 5, then p : s is:

SSC CPO 09/11/2022 (Shift-01)

(a) 2 : 5 (b) 6 : 25
(c) 5 : 2 (d) 25 : 6

39. If A : B = 2 : 3 and B : C = 7 : 8, find A : C.

SSC CHSL 08/07/2024 (Shift-04)

(a) 7 : 2 (b) 4 : 7
(c) 12 : 7 (d) 7 : 12

40. If P : Q : R = 4 : 7 : 9 and R : S = 2 : 5, then what is the value of P : S?

SSC MTS 16/06/2023 (Shift-02)

(a) 8 : 45 (b) 1 : 5
(c) 9 : 57 (d) 10 : 43

41. If a : b = 3 : 4, b : c = 2 : 3, and c : d = 5 : 6, then a : b : c : d is:

SSC CHSL 05/07/2024 (Shift-01)

(a) 10 : 20 : 30 : 36
(b) 15 : 20 : 35 : 36
(c) 15 : 20 : 30 : 36
(d) 15 : 25 : 30 : 36

42. If A : B = 8 : 13, B : C = 5 : 8 and C : D = 4 : 5, then A : B : C : D is equal to:

SSC Phase XII 20/06/2024 (Shift-03)

(a) 40 : 65 : 104 : 130
(b) 20 : 50 : 105 : 119
(c) 38 : 65 : 111 : 120
(d) 40 : 60 : 103 : 112

43. If A : B = 5 : 4, B : C = 6 : 5, C : D = 7 : 10, then what is the value of A : D?

SSC MTS 25/07/2022 (Shift-03)

(a) 21 : 25 (b) 7 : 3
(c) 21 : 20 (d) 25 : 24

44. If A : B = $\frac{1}{3}:\frac{1}{5}$, B : C = $\frac{1}{7}:\frac{1}{8}$ and C : D = $\frac{1}{10}:\frac{1}{21}$ then A : B : C : D is:

SSC MTS 06/09/2023 (Shift-03)

(a) 14 : 24 : 28 : 10
(b) 40 : 24 : 21 : 10
(c) 8 : 3 : 7 : 5
(d) 48 : 23 : 25 : 8

45. If P : Q = 3 : 4 and Q : R = 4 : 7, then find the value of (P + Q) : (Q + R) : (R + P).

SSC CGL TIER II 26/10/2023

(a) 10 : 3 : 11 (b) 11 : 4 : 7
(c) 3 : 4 : 7 (d) 7 : 11 : 10

46. If (a + b) : (b + c) : (c + a) = 15 : 14 : 11, and a + b + c = 40, then what is the value of (3a + b – 4c)?

SSC MTS 08/10/2021 (Shift-02)

(a) 15 (b) 14
(c) 17 (d) 18

47. If a, b and c are positive numbers such that $(a^2+b^2):(b^2+c^2):(c^2+a^2) = 34:61:45$, then b – a : c – b : c – a = ______.

SSC CGL TIER-II 29/06/2022

(a) 1 : 2 : 3 (b) 2 : 1 : 3
(c) 3 : 1 : 2 (d) 3 : 2 : 1

48. If K^2 : M : : M : 16, then what is the value of $(K^2 + 2M^2) : (K^2 + M^2)$?

SSC MTS 05/07/2022 (Shift-03)

(a) 1 : 1 (b) 33 : 17
(c) 17 : 16 (d) 32 : 17

49. If x and y are two numbers having opposite signs, and $x^2 : y^2 = 16 : 81$, then what is the value of $\frac{3x + 4y}{2x - 3y}$?

SSC MTS 05/10/2021 (Shift-01)

(a) $-\frac{24}{35}$ (b) $-\frac{27}{40}$
(c) $\frac{48}{35}$ (d) $\frac{12}{25}$

50. The sum of the two numbers is the same as 9 times their difference. The ratio of the numbers is:

SSC MTS 12/09/2023 (Shift-01)

(a) 9 : 5 (b) 3 : 7
(c) 5 : 4 (d) 3 : 4

51. If the income of T is 8 times hi savings, then his expenditure i ______ times his savings.

SSC MTS 11/09/2023 (Shift-0

(a) 8 (b) 7
(c) 6 (d) 5

52. Radhika owns 2 dogs, 3 rabbits and 4 parrots as pets. What is the ratio of the number of rabbits to the total number of pets Radhika owns?

SSC CGL 20/07/2023 (Shift-01

(a) 2 : 3 (b) 1 : 3
(c) 3 : 1 (d) 3 : 2

53. In a school, the total number of boys is 20% more than the total number of girls. What is the ratio of the number of boys to that of girls in the school?

SSC CPO 29/06/2024 (Shift-01)

(a) 6 : 5 (b) 5 : 6
(c) 5 : 3 (d) 4 : 5

54. Which of the following ratios is greater?

SSC CHSL 10/07/2024 (Shift-03)

(a) 2 : 3 (b) 1 : 5
(c) 8 : 3 (d) 7 : 4

55. Which of the following is the smallest ratio

SSC CPO 10/11/2022 (Shift-01)

(a) 41 : 92 (b) 33 : 41
(c) 42 : 49 (d) 35 : 47

56. Among the ratios 3 : 4, 5 : 8, 1 : 2, 6 : 9 which is the greatest?

SSC CHSL 03/07/2024 (Shift-01)

(a) 6 : 9 (b) 1 : 2
(c) 5 : 8 (d) 3 : 4

57. Ram has 12 hens and 5 cows, Shyam has 18 hens and 9 cows, Preetham has 4 hens and 8 cows, and Vinay has 10 hens and 7 cows. Who has a greater ratio of hens to cows?

SSC CPO 05/10/2023 (Shift-02)

(a) Shyam (b) Preetham
(c) Vinay (d) Ram

◆ TYPE – II ◆
WORD PROBLEMS BASED ON BASIC CONCEPTS

58. Rishi and Sarita have ₹4,760. If $\frac{9}{16}$ of Rishi's amount is equal to $\frac{3}{4}$ of Sarita's amount, how much does Sarita have ?

SSC Phase XII 24/06/2024 (Shift-03)

(a) ₹2,720 (b) ₹3,570
(c) ₹2,040 (d) ₹2,190

59. Adi and dia togetehr have Rs.1440. If $\frac{3}{10}$ of Adi's amount is equal to $\frac{3}{5}$ of Dia's amount, how much amount does Dia have?

SSC CGL TIER-II (20/01/2025)

(a) Rs.480 (b) Rs.540
(c) Rs.464 (d) Rs.512

60. A number 37 is divided into two parts such that 5 times one part and 11 times the other is together equal to 227. Find the value of 9 times the smaller number.

SSC CHSL TIER-II (18/11/2024)

(a) 62 (b) 60
(c) 61 (d) 63

61. A sum of money is to be distributed among 3 friends P, Q and R in the Ratio of 5 : 3 : 4. If P gets ₹1,500 more than R, what is Q's share?

SSC CGL TIER-II (18/01/2025)

(a) ₹4,950 (b) ₹4,680
(c) ₹4,500 (d) ₹5,100

62. The ratio of marks of A and B is 3 : 4 and the ratio of marks of B and C is 4 : 5. If the difference in the marks of C and A is 30, then how much marks does B get?

SSC CPO 27/06/2024 (Shift-03)

(a) 52 (b) 64
(c) 60 (d) 56

63. A sum of money is divided among P, Q, R and S in the proportion of 4 : 9 : 2 : 3. If Q gets ₹560 more than R, then the share of S is:

SSC CGL 11/09/2024 (Shift-01)

(a) Rs.140 (b) Rs.340
(c) Rs.240 (d) Rs.440

64. The sum of the four numbers A, B, C and D is 875. If the ratio of A to B is 1 : 2, the ratio of B to C is 3 : 1 and the ratio of C to D is 2 : 3, find the value of C.

SSC Phase XII 26/06/2024 (Shift-04)

(a) 125 (b) 120
(c) 135 (d) 130

65. A sum of ₹ x is divided between A, B, C and D such that the ratio of the shares of A and B is 3 : 2, that of B and C is 9 : 8 and that of C and D is 4 : 3. If the difference between the shares of B and D is ₹ 708, then what is the value of x?

SSC MTS 27/10/2021 (Shift-02)

(a) 8732 (b) 8496
(c) 8850 (d) 8614

66. The ratio of income of P and Q is 1 : 2. Ratio of income of Q and R is 3 : 2. If one-third of P's income is ₹4400 less than the half of P's income, then what is the Q's income'?

SSC CHSL 14/03/2023 (Shift-02)

(a) ₹56600 (b) ₹52800
(c) ₹46600 (d) ₹41200

67. A sum of ₹x is divided among A, B and C such that the ratio of shares of A and B is 7 : 12 and that of B and C is 8 : 5. If the difference in the share of A and C is ₹214, then the value of x is.

SSC CGL 07/06/2019 (Shift-03)

(a) ₹11556 (b) ₹11128
(c) ₹11770 (d) ₹11342

68. The ratio of the prices of A and B is 5:9 and prices of C and D is 24 : 13. The price of C is ₹1500 more than the price of B, and the price of D is ₹1300. Find the price of A.

SSC CHSL 15/03/2023 (Shift-03)

(a) ₹2,400 (b) ₹900
(c) ₹1,000 (d) ₹500

69. The salaries of A, B and C are in ratio of $\frac{3}{2}:\frac{6}{5}:\frac{4}{3}$. The salary of A and B together is ₹ 40,500. By what percentage is the salary of A more than that of C?

SSC CPO 10/11/2022 (Shift-03)

(a) 12% (b) 13%
(c) 11.5% (d) 12.5%

70. Three numbers are in the ratio $\frac{4}{5}:\frac{5}{6}:\frac{9}{10}$. The difference between the smallest and the greatest numbers is 12. Find the number which is NEITHER the smallest NOR the greatest.

SSC CGL 24/07/2023 (Shift-02)

(a) 96 (b) 108
(c) 100 (d) 104

71. A sum of ₹17,600 was divided between Jeevan, Praveen and Kanan, such that the ratio of the sums received by Jeevan and Praveen was 5 : 8, while the ratio of the sums received by Praveen and Kanan was 3 : 2 How much did Jeevan receive as his share?

SSC CPO 28/06/2024 (Shift-01)

(a) ₹4,900 (b) ₹4,750
(c) ₹4,850 (d) ₹4,800

72. Certain sum is divided among A, B, C and D such that the ratio of the shares of A : B = 1 : 3 ; B : C = 2 : 5 ; C : D = 2 : 3. If the difference between the shares of B and D is ₹6,435, then the total sum (in ₹) is:

SSC PHASE-IX 2022

(a) 15,477 (b) 17,457
(c) 14,775 (d) 17,745

73. A sum of money was divided between Cyrus, Rohan and Mishti. The ratio of the sums received by Cyrus and Rohan was 3 : 2, while the ratio of the sums received by Rohan and Mishti was 7: 12. If the sum received by Cyrus was ₹1,800 less than the sum received by Mishti, how many rupees did Rohan receive as his share?

SSC Phase XII 24/06/2024 (Shift-03)

(a) ₹7,560 (b) ₹9,240
(c) ₹6,300 (d) ₹8,400

74. A certain sum is divided among A, B, C and D such that the ratio of the shares is A : B : C : D = 4 : 12 : 30 : 45. If the difference between the shares of A and D is ₹5,535, then the total sum (in ₹) is:

SSC CGL Tier-I 24/08/2021

(a) 12285 (b) 11000
(c) 12785 (d) 13550

75. A sum of ₹ 12,992 is divided among A, B and C such that the ratio of the shares of A and C is 4 : 15 and that of the shares of A and B is 2 : 5. The difference (in ₹) between the shares of B and C is:

SSC CHSL 19/04/2021 (Shift-02)

(a) 1,792 (b) 3,136
(c) 2,240 (d) 2,688

76. In Class 8 of a school, the ratio of students playing cricket to those playing football is 27 : 13, while the ratio of those playing football to those playing hockey is 26 : 14. If the total number of students in Class 8 is 470, and each student plays exactly one game, find the percentage of students of the class playing cricket. [Give your answer correct to two decimal places.]

SSC CHSL 25/05/2022 (Shift-02)

(a) 55.47% (b) 54.75%
(c) 57.45% (d) 56.35%

77. A sum of ₹ 7,410 is divided between A, B and C such that the ratio of the share of A to the combined share of B and C is 9 : 17 and the ratio of the share of C to the combined share of A and B is 5 : 8. What is the ratio of the share of B and C?

SSC PHASE-IX 2022

(a) 13 : 17 (b) 7 : 10
(c) 9 : 10 (d) 8 : 9

78. Sum of 6,300 is divided among A, B, C and D such that the ratio of the combined share of A and D to the combined share of B and C is 11 : 10 and the ratio of the share of B and D is 8 : 9. If C receives ₹1,560, then what is the difference (in ₹) between the share of A and B ?

SSC PHASE-IX 2022

(a) 180 (b) 240
(c) 120 (d) 160

79. A sum of ₹46,800 is divided among A, B, C and D in such a way that the ratio of the combined share of A and D to the combined share of B and C is 8 : 5. The ratio of the share of B to that of C is 5: 4. A receives ₹18,400. If x is the difference between the shares of A and B and y is the difference between the shares of C and D, then what is the value of (x – y) (in ₹)?

SSC CGL TIER-II 29/01/2022

(a) 6500 (b) 7000
(c) 5000 (d) 6000

80. A sum of ₹1250 has to distributed among A, B, C and D. Total share of B and D is equal to $\left(\frac{14}{11}\right)$ of total share of A and C. Share of D is half of share of A. Share of C is 1.2 of share of A. What are the shares of A, B, C and D respectively?

SSC CGL TIER-II 08/08/2022

(a) ₹250, ₹525, ₹300, ₹125
(b) ₹250, ₹575, ₹300, ₹125
(c) ₹250, ₹575, ₹300, ₹175
(d) ₹350, ₹525, ₹300, ₹125

81. Two numbers are, respectively, 30% and 40% more than the third number. The ratio of the second number to the first number is:

SSC CHSL 10/07/2024 (Shift-03)

(a) 26 : 28 (b) 14 : 13
(c) 39 : 42 (d) 13 : 14

82. Raju and Ramu have more land than Sonu by 15% and 25%, respectively. What is the ratio of land owned by Raju and Ramu?

SSC CHSL 10/07/2024 (Shift-01)

(a) 23 : 25 (b) 15 : 25
(c) 25 : 23 (d) 21 : 23

83. Two numbers are, respectively, 30% and 60% more than a third number. The ratio of the two numbers is:

SSC CHSL 09/07/2024 (Shift-01)

(a) 13 : 17 (b) 12 : 13
(c) 11 : 15 (d) 13 : 16

84. Two numbers A and B are such that the sum of 6% of A and 4% of B is two-fifth of the sum of 7% of A and 11% of B, then the ratio A: B is:

SSC MTS 01/09/2023 (Shift-01)

(a) 1 : 7 (b) 3 : 7
(c) 5 : 8 (d) 1 : 8

85. A man invest ₹44,000 in some shares in the ratio 1 : 4 : 5 which pay dividends of 10%, 15% ,and 25% on his investment for one year respectively . His total dividend income is:

SSC CHSL 07/08/2023 (Shift-01)

(a) ₹7,850 (b) ₹8,580
(c) ₹7,970 (d) ₹8,510

86. Salaries of B, C, D and E are in the ratio of 2 : 3 : 4 : 5 respectively. Their salaries are increased by 20%, 30%, 40% and 50% respectively. If the increased salary of D is ₹560, then what is the sum of the original salaries of B , C, D and E?

SSC CGL TIRE-II 08/08/2022

(a) ₹1260 (b) ₹1820
(c) ₹1560 (d) ₹1400

87. The number of books on Mathematics, Physics and Chemistry in a University library is in the ratio 8 : 5 : 9. There is a proposal to increase these books by 10%, 5% and 5% respectively. What will be the ratio of the number of books after increment?

SSC CGL 02/12/2022 (Shift-04)

(a) 212 : 117 : 47
(b) 37 : 47 : 83
(c) 176 : 105 : 189
(d) 189 : 115 : 117

88. Raj divides ₹1,200 in the ratio 2 : 1 : 3 among three of his friends. The amount equal to the sum of three times the largest share and two times the smallest share is:

SSC CGL 12/09/2024 (Shift-01)

(a) ₹2,400 (b) ₹1,800
(c) ₹2,200 (d) ₹2,000

89. Four numbers are in the ratio 1 : 2 : 3 : 5. Two time their sum is 44. Find the ratio in the numbers obtained by subtracting 3 from the cube of each number.

SSC CPO 09/11/2022 (Shift-01)

(a) 2 : 31 : 204 : 999
(b) 2 : 13 : 208 : 992
(c) 11 : 67 : 219 : 1003
(d) 5 : 61 : 213 : 997

90. The cost of 3 cups and 5 plates is ₹1,080 and the costs of 2 cups and 4 plates is ₹840. Find the ratio of the cost of a cup to the cost of a plate.

SSC CHSL 03/08/2023 (Shift-03)

(a) 1 : 3 (b) 2 : 3
(c) 1 : 1 (d) 1 : 2

91. Rewa has some hens and some goats. If the total number of animal heads is 100 and the total number of animal feet is 348, then what is the total number of goats with Rewa?

SSC CGL TIER- II 03/03/2023

(a) 76 (b) 74
(c) 55 (d) 80

◆ TYPE – III ◆
BASED ON ADDITION/SUBTRACTION

92. What should be added to each term of the ratio 5 : 11 so that the ratio becomes 3 : 5 ?

SSC CHSL 11/07/2024 (Shift-04)

(a) 2 (b) 4
(c) 6 (d) 5

93. Monthly salaries of Anil and Kumud are in the ratio 19 : 17. If Anil and Kumud get salary hike of ₹ 2000 and ₹1000 respectively, then the ratio in their salaries become 8 : 7. What is the present salary of Kumud after increase (in ₹)?

SSC CGL 24/08/2021 (Shift-02)

(a) 38000 (b) 18000
(c) 34000 (d) 35000

94. The ratio between male and female members in a club is 2 : 3. If the number of male members is increased by 200, the ratio becomes 5 : 6. How many female members are there in the club?

SSC CGL 12/09/2024 (Shift-02)

(a) 1200 (b) 900
(c) 1400 (d) 1000

95. In a company, the ratio of men and women is 5 : 3, respectively. When 150 additional women are employed in the company, the ratio becomes 5 : 4. How many men are employed in the company?

SSC CGL 17/09/2024 (Shift-02)

(a) 850 (b) 750
(c) 550 (d) 950

96. In a collection of rare coins, there is one gold coin for every four non-gold coins. If 20 more gold coins are added to the collection, the ratio of the number of gold coins to that of non-gold coins will be 2 : 3. The total number of coins in the collection will now become ____.

SSC CGL 17/09/2024 (Shift-01)

(a) 80 (b) 60
(c) 100 (d) 48

97. The ratio of the number of boys to the number of girls in a school of 1650 students is 6 : 5. If 124 new boys are admitted and few new girls are admitted, the ratio changes to 4 : 3. What is the ratio of the newly admitted girls to the newly admitted boys?

SSC MTS 13/09/2023 (Shift-01)

(a) 4 : 3 (b) 3 : 4
(c) 9 : 62 (d) 62 : 9

98. The students in three batches of a dance class are in ratio 2 : 3 : 5. If 20 students increase in each batch the ratio changes to 4 : 5 : 7. Find the total number of students in the three batches before the increase.

SSC Phase-XI 27/06/2023 (Shift-01)

(a) 120 (b) 100
(c) 150 (d) 80

99. Weight of Ayush and Abhishek are in the ratio of 8 : 5. Abhishek's weight increases by 40 percent and total weight of Ayush and Abhishek both increases by 60 percent. If total weight becomes 104 kg, then what is the weight of Ayush after the increment?

SSC CHSL 10/03/2023 (Shift-03)

(a) 60 kg (b) 75 kg
(c) 69 kg (d) 72 kg

100. Two numbers are in the ratio of 3 : 7. If 11 is subtracted from each, the ratio between the numbers becomes 7 : 20. Find the smaller number.

SSC CPO 27/06/2024 (Shift-01)

(a) 39 (b) 21
(c) 36 (d) 27

101. Two numbers are in the ratio 4 : 5. If 3 is added to the smaller and 7 is subtracted from the larger number, they are in the ratio 1 : 1. Find the numbers.

SSC Phase XII 20/06/2024 (Shift-02)

(a) 60, 75 (b) 20, 25
(c) 40, 50 (d) 55, 44

102. The ratio of number of boys and girls in a college is 3 : 2. If 40 boys leave the college and 40 girls join the college, then their ratio will becomes 2 : 3. What is the initial number of boys in the college?

SSC CHSL 10/03/2023 (Shift-04)

(a) 120 (b) 150
(c) 225 (d) 75

103. The ratio of boys to girls initial in a college is 5 : 6. If 40 boys leave the college and 50 girls join the college, the ratio will become 8 : 11. Find the number of girls (initial) in the college.

SSC CGL 19/09/2024 (Shift-03)

(a) 740 (b) 860
(c) 720 (d) 640

104. Two numbers are in the ratio 4 : 5. If 17 is subtracted from each, the new numbers are in the ratio 11 : 14. If 20 is added to each of the original numbers, then the ratio becomes:

SSC Phase XII 25/06/2024 (Shift-04)

(a) 241 : 275 (b) 224 : 241
(c) 224 : 275 (d) 275 : 241

105. In a school of 720 students, the ratio of boys to girls is 3 : 5. Find how many new boys may be allowed to the school if 18 new girls are admitted, so that the ratio of boys to girls changes to 2 : 3.

SSC CPO 05/10/2023 (Shift-03)

(a) 42 (b) 50
(c) 44 (d) 38

106. On a tree, there are some parrots and some pigeons in the ratio of 7 : 9, respectively. After an hour, 8 parrots fly away, and 6 pigeons and 10 sparrows come and sit on the tree. The ratio of the parrots and the pigeons on the tree now is 1 : 4. What is the ratio of the parrots and the sparrows that are now on the tree?

SSC MTS 20/07/2022 (Shift-02)

(a) 1 : 1 (b) 1 : 2
(c) 3 : 5 (d) 4 : 5

107. In an examination, the number of students who passed and the number of students who failed were in the ratio 25: 4. If one more student had appeared and passed and the number of failed students was 3 less than earlier, the ratio of passed students to failed students would have become 22: 3. What is the difference between the number of students who, initially, passed the examination and the number of students who failed the examination?

SSC CGL TIER-II 03/02/2022

(a) 132 (b) 126
(c) 174 (d) 150

◆ TYPE – IV ◆
BASED ON COINS

108. A bag contains a total of 180 coins in the denominations of ₹5 and ₹1. Find the number of ₹5 coins in the bag, if the total value of the coins is ₹500.

SSC Phase-XII 26/06/2024 (Shift-02)

(a) 100 (b) 60
(c) 120 (d) 80

109. A bag contains ₹550 in the form of 50 p, 25 p and 20 p coins in the ratio 2 : 3 : 5. The difference between the amounts that are contributed by the 50p and the 20p coins is:

SSC CGL 17/07/2023 (Shift-03)

(a) ₹30 (b) ₹20
(c) ₹10 (d) ₹0

110. A bag contains one rupee, 50-paise and 25-paise coins in the ratio 3 : 4 : 6. If the total amount is ₹143, the number of 50-paise coins is:

SSC Phase XII 26/06/2024 (Shift-04)

(a) 66 (b) 90
(c) 88 (d) 132

111. R pays ₹100 to P with ₹5, ₹2 and ₹1 coins. The total number of coins used for paying are 40. What is the number of coins of denomination ₹5 in the payment?

SSC CGL 09/09/2024 (Shift-01)

(a) 16 (b) 17
(c) 18 (d) 13

112. A money bag contains one rupee, 5 rupee and 10 rupee coins in the ratio of 3 : 5 : 7 respectively. If the total amount in the bag is Rs.980,then find the number of coins of Rs.10.

SSC CGL 10/09/2024 (Shift-01)

(a) 69 (b) 70
(c) 71 (d) 68

113. A payment of ₹120 is made with ₹10, ₹5 and ₹2 coins. A total of 25 coins are used. Which of the following is the number of ₹10 coins used in the payment?

SSC CGL 12/09/2024 (Shift-01)

(a) 6 (b) 4
(c) 10 (d) 8

114. P pays Q a sum of ₹150 using coins of ₹2, ₹5 and ₹10. He uses a total of 50 coins. If the ratio of ₹2 and ₹5 coins used is 5 : 2, then how many coins of ₹10 are used in the payment?

SSC CHSL 01/07/2024 (Shift-03)

(a) 1 (b) 4
(c) 5 (d) 2

115. The numbers of coins of 25 paisa, 50 paisa, ₹ 2 and ₹ 5 are in the ratio 5 : 4 : 3 : 1 respectively. If the total amount of coins is ₹ 285, then what will be the difference between the number of 25 paisa and ₹ 5 coins?

SSC CGL TIER- II 06/03/2023

(a) 60 (b) 30
(c) 80 (d) 40

116. Atul purchased Bread costing ₹20 and gave a 100 rupee note to the shopkeeper. Shopkeeper gave the balance money in coins of denomination ₹2, ₹5 and ₹10. If these coins are in the ratio 5 : 4 : 1, then how many ₹5 coins did the shopkeeper give?

SSC CGL 13/08/2021(Shift-03)

(a) 5 (b) 6
(c) 8 (d) 4

117. Aman has certain number of notes of denomination ₹20 and ₹10 which amount to ₹390. If the numbers of notes of each kind are interchanged, then the new amount is ₹90 less than before. Find the number of notes of ₹20 denomination.

SSC CGL 23/09/2024 (Shift-01)

(a) 16 (b) 12
(c) 15 (d) 14

118. Pooja, Chameli and Anju have a total of ₹450 in their purses. Pooja has ₹50 more than Chameli. Anju has two times what Pooja has. How much do Pooja, Chameli and Anju, respectively, have in their purses?

SSC Phase XII 20/06/2024 (Shift-02)

(a) ₹125, ₹50 and ₹275
(b) ₹100, ₹50 and ₹300
(c) ₹150, ₹75 and ₹225
(d) ₹125, ₹75 and ₹250

119. Radhika requested the cashier of a bank to get her coins in lieu of her cheque worth ₹1,845. Cashier gave her a packet containing ₹5, ₹10 and ₹20 coins in the ratio of 3 : 5 : 7. What is the total worth of the smallest coin received by her?

SSC CHSL 01/07/2024 (Shift-01)

(a) ₹125 (b) ₹105
(c) ₹145 (d) ₹135

120. In a bag, the number of ₹5 coins is 8 more than the number of ₹10 coins but 20% less than the number of ₹2 coins. If the total amount in the bag is ₹270, what is the number of ₹5 coins?

SSC MTS 12/07/2022 (Shift-02)

(a) 15 (b) 20
(c) 25 (d) 18

121. In a bag there are coins of ₹5, ₹10 and ₹20 denominations. The total number of coins in the bag is 240. If the number of coins of ₹5, ₹10 and ₹20 denominations are in the ratio of 2 : 3 : 5, then what is the total amount of money in the bag?

SSC MTS 12/07/2022 (Shift-02)

(a) ₹3540 (b) ₹4600
(c) ₹4620 (d) ₹3360

◆ TYPE – V ◆
INCOME EXPENDITURE & SAVINGS

122. The ratio of monthly income and expenditure of a man is 7 : 3. If his expenditure is ₹5,400, find his monthly income.

SSC CPO 05/10/2023 (Shift-03)

(a) ₹11,500 (b) ₹13,300
(c) ₹12,600 (d) ₹10,400

123. The monthly income of two persons is in the ratio of 4 : 5 and their expenditures are in the ratio 7 : 9. If each saves ₹ 50 per month, then their monthly incomes are:

SSC CPO 09/11/2022 (Shift-02)

(a) ₹ 900; ₹ 500
(b) ₹ 400; ₹ 500
(c) ₹ 700; ₹ 900
(d) ₹ 400; ₹ 700

124. The expenditure and savings of a person are in ratio of 4 : 3. His savings increase by $\frac{1}{5}$ of his income and income remains the same. What is the new ratio of his expenditure and savings?

SSC CHSL 10/03/2023 (Shift-01)

(a) 12 : 17 (b) 14 : 17
(c) 13 : 22 (d) 15 : 13

125. The annual incomes of Anand and Bharath are in the ratio 3 : 5 and their annual expenses are in the ratio 1 : 3. If each of them saves ₹ 10,000 at the end of the year, then the annual income of Bharath is:

SSC PHASE-XI 28/06/2023 (Shift-01)

(a) ₹25,000 (b) ₹12,000
(c) ₹15,000 (d) ₹30,000

126. The incomes of P, Q and R are in the ratio 10 : 12 : 9 and their expenditures are in the ratio 12 : 15 : 8. If Q saves 25% of his income, then what is the ratio of the savings of P, Q and R?

SSC CGL 12/09/2024 (Shift-01)

(a) 15 : 14 : 21 (b) 14 : 15 : 21
(c) 21 : 15 : 14 (d) 21 : 14 : 15

127. The salaries of P and Q together amount to ₹ 6,40,000. P and Q save 60% and 40%, respectively, of their individual salaries. If their expenditures are the same, then what is the ratio of P's salary to Q's salary?

SSC MTS 14/09/2023 (Shift-03)

(a) 2 : 3 (b) 3 : 2
(c) 3 : 4 (d) 4 : 3

128. The salaries of P and Q together amount to Rs.9,60,000. P and Q save 64% and 44%, respectively of their individual salaries. If P's expenditure is 1.5 times Q's expenditure, then what is the ratio of P's salary to Q's salary?

SSC CGL 25/09/2024 (Shift-01)

(a) 2 : 3 (b) 7 : 3
(c) 3 : 7 (d) 3 : 2

129. The monthly income of an employee was ₹26,500 and his monthly expenditure was ₹22,000. Next year his income increased by 20% and his expenditure increased by 15%. Find the percentage increase in his savings.

SSC CPO 05/10/2023 (Shift-02)

(a) $44\frac{4}{9}\%$ (b) $44\frac{7}{9}\%$
(c) $44\frac{5}{9}\%$ (d) $44\frac{8}{9}\%$

130. Avinash's monthly salary is ₹50,000 and his monthly expenditure is ₹18,000. Radha's monthly salary is ₹60,000 and her monthly expenditure is ₹24,000. Find the ratio of Radha's savings to Avinash's saving's.

SSC CGL 27/07/2023 (Shift-03)

(a) 9 : 8 (b) 9 : 7
(c) 6 : 5 (d) 8 : 7

131. The monthly incomes of A, B and C are in the ratio 2 : 9 : 3 and their expenses are in the ratio 3 : 9 : 5. If A's saving is half of his total income, then savings of A, B and C are, respectively, in the ratio of:

SSC CGL 26/09/2024 (Shift-03)

(a) 3 : 9 : 2 (b) 2 : 5 : 2
(c) 3 : 18 : 4 (d) 5 : 18 : 4

132. The ratio of income of A to that of B is 4 : 3. The expenditure of A is $\frac{5}{12}$ of his income and the expenditure of B is $\frac{7}{15}$ of his income, The difference between their expenditures is ₹ 4,500. Find the income of B.

SSC CHSL 25/05/2022 (Shift-03)

(a) ₹49,625 (b) ₹48,625
(c) ₹51,625 (d) ₹50,625

133. The income of A is $\frac{2}{3}$ of B's income and the expenditure of A is $\frac{3}{4}$ of B's expenditure. If $\frac{1}{3}$ of the income of B is equal to the expenditure of A, then the ratio of the savings of A to those of B is:

SSC CGL TIER-II 29/01/2022

(a) 5 : 3 (b) 3 : 5
(c) 4 : 3 (d) 3 : 4

134. The ratio of the incomes of A and B in 2020 was 5 : 4. The ratios of their individual incomes in 2020 and 2021 were 4 : 5 and 2 : 3, respectively. If the total income of A and B in 2021 was ₹7,05,600, then what was the income (in) of B in 2021?

SSC CGL TIER-II 03/02/2022

(a) ₹3,45,600 (b) ₹2,79,700
(c) ₹3,60,000 (d) ₹4,25,900

135. The ratio of the incomes of A and B in the last year was 4 : 3. The ratios of their individual incomes in the last year and the present year are 3 : 4 and 5 : 6, respectively. If their total income in the present year is ₹ 24.12 lakhs, then the sum of the income (in ₹ lakhs) of A in the last year and that of B in the present year is:

SSC CGL TIER-II 29/01/2022

(a) 22.17 (b) 21.28
(c) 10.98 (d) 20.52

◆ TYPE – VI ◆
MISCELLANEOUS QUESTIONS

136. The compound ratio of 3 : 4 and 6: 7 is 36 : X. find X

SSC CHSL 03/08/2023 (Shift-04)

(a) 64 (b) 75
(c) 56 (d) 48

137. If two kinds of rice which cost ₹25 a kg and ₹40 a kg are mixed in the ratio of 3 : 2, then find the cost of the mixture per kg

SSC CPO 29/06/2024 (Shift-01)

(a) ₹32 (b) ₹33
(c) ₹31 (d) ₹30

138. Rice worth, ₹504 per kg and, ₹540 per kg are mixed with the third variety in the ratio 1 : 1 : 2. If the mixture is worth, ₹612 per kg. Find the price (per kg in 1) of the third variety.

SSC CHSL 10/08/2023 (Shift-04)

(a) 630 (b) 702
(c) 764 (d) 522

139. Wheat worth ₹80 per kg and ₹50 per kg is mixed with a third variety in the ratio 1 : 2 : 3 . If the mixture is worth ₹75 per kg, then the price of the third variety per kg will be equal to:

SSC CGL 07/12/2022 (Shift-01)

(a) ₹95 (b) ₹85
(c) ₹80 (d) ₹90

140. The cost of two varieties of tea is ₹300 and ₹ 375 respectively. If both the varieties of tea are mixed together in the ratio 3 : 2, then what should be the price of mixed variety of tea per kg?

SSC CPO 09/11/2022 (Shift-01)

(a) ₹340 (b) ₹330
(c) ₹350 (d) ₹360

141. The ratio of prices of coffee and tea is 3 : 4 and the ratio of their quantities consumed by a family is 4 : 7. Find the ratio of expenditure on coffee and tea.

SSC CHSL MAINS 10/01/2024 (Shift-01)

(a) 7 : 4 (b) 3 : 7
(c) 4 : 7 (d) 7 : 3

142. By mistake, instead of dividing ₹702 among Ram, Ramesh, and Naresh in the ratio $\frac{1}{3}:\frac{1}{4}:\frac{1}{6}$, it was divided in the ratio of 3 : 4 : 6. Who gained the most and by how much?

SSC CGL 02/12/2022 (Shift-01)

(a) Ram ₹158
(b) Ramesh ₹158
(c) Naresh ₹168
(d) Ram ₹168

143. The ratio of the number of employees (male and female) in offices A and B is 2 : 3. The ratio of the female employees in A and B is 1 : 2, and the ratio of the female employees in A to the total employees in A is 1 : 3. What is the ratio of the male employees in A and B?

SSC PHASE-IX 2022

(a) 6 : 7 (b) 5 : 6
(c) 4 : 5 (d) 3 : 2

144. In a party hall, there are people in blue and red dresses. The ratio of number of men in blue to the number of women in red is 3 : 7. The ratio of men in red to the number of women in blue is 2 : 1. If the ratio of number of people in blue to the number of people in red is 35 : 76, then what is the ratio of number of men to the number of women?

SSC MTS 04/05/2023 (Shift-01)

(a) 47 : 51 (b) 40 : 43
(c) 62 : 57 (d) 52 : 59

145. There are 'y' yellow marbles and 'b' blue marbles in a box. 18% of the yellow marbles were added to 24% of the blue marbles, and the total was 30. Three times the number of yellow marbles exceeds two times the number of blue marbles by 200. What is the ratio of y^2 to b^2?

SSC CGL 17/09/2024 (Shift-03)

(a) 6 : 5 (b) 4 : 1
(c) 2 : 1 (d) 5 : 2

146. A blended tea in a barrel contains Assam, Darjeeling and Nilgiri Hills tea in the ratio 2 : 3 : 1. Another barrel contains Darjeeling. Nilgiri Hills and Kangra Valley tea in the ratio 5 : 4 : 3. If equal weights of both blended tea mix together to make a new brand, then the weight of Kangra valley per kilogram in the new brand is:

SSC CHSL, 10/08/2023 (Shift-03)

(a) 500 gm (b) 100 gm
(c) 250 gm (d) 125 gm

147. Vikas gave 3 examinations. The respective ratio of marks scored by him in the 3 examinations is 3 : 5 : 6. The respective ratio of maximum marks of the 3 examination is 7 : 11 : 10. If he scored 50 percent marks in total, then in how many examination has he scored marks more than 50 percent?

SSC MTS 13/06/2023 (Shift-02)

(a) None (b) 1
(c) 3 (d) 2

148. A company is manufacturing boxes of three types – plastic, wood and glass. The ratio of the numbers of plastic, wood and glass boxes is 2 : 3 : 5. The difference between the numbers of wood and glass boxes is 144. If the number of plastic boxes is increased by 25%, then what will be the number of plastic boxes now?

SSC CPO 04/10/2023 (Shift-01)

(a) 144 (b) 216
(c) 360 (d) 180

149. The cost of a piece of diamond varies with the square of its weight. A diamond of ₹6,084 value is cut into 3 pieces whose weights are in the ratio 3 : 2 : 1. Find the loss involved in the cutting.

SSC CGL 03/12/2022 (Shift-02)

(a) ₹3,768 (b) ₹3,718
(c) ₹3,168 (d) ₹3,518

150. The value of a stone is proportional to the square of its weight. A stone worth ₹1,20,000 is broken into two pieces in the ratio of 2 : 3. What is the total price of the two small stones?

SSC MTS 07/07/2022 (Shift-01)

(a) ₹ 68,400 (b) ₹ 62,400
(c) ₹ 66,500 (d) ₹ 65,400

151. The price of a semi-precious stone weighing 48 g, is ₹2,30,400. It is broken into two pieces whose weights are in the ratio of 5 : 7. If the price is proportional to the square of the weight, then the loss (in ₹) incurred, is:

SSC MTS 18/10/2021 (Shift-02)

(a) 112000 (b) 40000
(c) 118400 (d) 78400

152. The cost of a diamond is directly proportional to the square of its weight. The cost of a 14 gm diamond is ₹2560. This diamond got broken down into two pieces in the ratio of 5 : 9. How much loss percent is incurred due to this breakage?
(Correct to two decimal places)

SSC CGL TIER-II 08/08/2022

(a) 53.47 % (b) 49.71 %
(c) 55.41 % (d) 45.92 %

153. The cost of a diamond varies directly as the square of its weight. Once, this diamond broke into four pieces with weights in the ratio of 4 : 3 : 2 : 1. When the pieces were sold, the merchant got Rs.63,000 less than that of one piece. Find the original price of the diamond.

SSC CGL 19/09/2024 (Shift-01)

(a) Rs.86,000
(b) Rs.80,000
(c) Rs.90,000
(d) Rs.75,000

ANSWER KEY

1.	(a)	2.	(c)	3.	(c)	4.	(d)	5.	(c)	6.	(d)	7.	(b)	8.	(c)	9.	(d)	10.	(b)
11.	(d)	12.	(a)	13.	(c)	14.	(c)	15.	(a)	16.	(c)	17.	(a)	18.	(b)	19.	(c)	20.	(c)
21.	(b)	22.	(a)	23.	(c)	24.	(b)	25.	(c)	26.	(d)	27.	(c)	28.	(b)	29.	(a)	30.	(d)
31.	(a)	32.	(d)	33.	(d)	34.	(a)	35.	(a)	36.	(b)	37.	(c)	38.	(b)	39.	(d)	40.	(a)
41.	(c)	42.	(a)	43.	(c)	44.	(b)	45.	(d)	46.	(b)	47.	(b)	48.	(b)	49.	(a)	50.	(c)
51.	(b)	52.	(b)	53.	(a)	54.	(c)	55.	(a)	56.	(d)	57.	(d)	58.	(c)	59.	(a)	60.	(d)
61.	(c)	62.	(c)	63.	(c)	64.	(a)	65.	(d)	66.	(b)	67.	(d)	68.	(d)	69.	(d)	70.	(c)
71.	(d)	72.	(d)	73.	(d)	74.	(a)	75.	(c)	76.	(c)	77.	(b)	78.	(b)	79.	(d)	80.	(b)
81.	(b)	82.	(a)	83.	(d)	84.	(d)	85.	(b)	86.	(d)	87.	(c)	88.	(c)	89.	(d)	90.	(a)
91.	(b)	92.	(b)	93.	(d)	94.	(a)	95.	(b)	96.	(a)	97.	(c)	98.	(b)	99.	(c)	100.	(a)
101.	(c)	102.	(a)	103.	(c)	104.	(c)	105.	(a)	106.	(c)	107.	(b)	108.	(d)	109.	(d)	110.	(c)
111.	(d)	112.	(b)	113.	(d)	114.	(a)	115.	(c)	116.	(c)	117.	(a)	118.	(d)	119.	(d)	120.	(b)
121.	(d)	122.	(c)	123.	(b)	124.	(c)	125.	(a)	126.	(b)	127.	(b)	128.	(b)	129.	(a)	130.	(a)
131.	(c)	132.	(d)	133.	(b)	134.	(a)	135.	(d)	136.	(c)	137.	(c)	138.	(b)	139.	(d)	140.	(b)
141.	(b)	142.	(c)	143.	(c)	144.	(d)	145.	(b)	146.	(d)	147.	(b)	148.	(d)	149.	(b)	150.	(b)
151.	(a)	152.	(d)	153.	(c)														

SOLUTIONS

1. (a)

$$\begin{array}{ccc} R & : & G \\ 3 & : & 4 \\ \downarrow{\times 30} & & \downarrow{\times 30} \\ \boxed{90} & & 120 \end{array}$$

2. (c)

$$\begin{array}{ccccc} I & & II & & Total \\ 2 & : & 3 & = & 5 \\ \downarrow{\times 27} & & \downarrow{\times 27} & & \downarrow{\times 27} \\ \boxed{54} & & \boxed{81} & & 135 \end{array}$$

∴ Req. no = 54, 81

3. (c)

$$\begin{array}{ccc} \text{Quantity I} & : & \text{Quantity II} \\ 3 & : & 5 \\ \downarrow & & \downarrow \\ 155 & & 5 \times \frac{155}{3} \\ & & \boxed{= 258.3\text{ kg}} \end{array}$$

4. (d)

$$\begin{array}{ccc} \text{Black} & : & \text{White} \\ 5 & : & 9 \\ \downarrow{\times 50} & & \downarrow{\times 50} \\ \boxed{250} & & 450 \end{array}$$

5. (c)

$$\begin{array}{ccc} A & : & B \\ 2 & : & 5 \\ & \text{Diff.} & \\ \downarrow{\times 70} & & \\ \boxed{140} & & \end{array}$$

3 unit → 210
1 unit → 70

6. (d)

$$\begin{array}{ccc} 1^{st}\text{ no.} & : & 2^{nd}\text{ no.} \\ 7 & : & 3 \\ & \text{Diff.} & \end{array}$$

4 unit → 48
1 unit → 12
Sum of two numbers = (7 + 3) units
= 10 × 12 = 120

7. (b) School Bag : Dress

$$\underbrace{8 \quad : \quad 7}_{\text{Diff.}}$$

1 unit ⟶ Rs. 400

∴ Price of school dress = 7 × 400
= ₹2800

8. (c)

$$\begin{array}{ccc} A & : & B \\ 5 & & 3 \end{array}$$

$$\underbrace{5 \quad 3}_{\text{Diff.}}$$

2 unit → 34

1 unit → 17

∴ 3 unit → 51

9. (d)

$$\begin{array}{ccccc} \text{Weight of box} & : & \text{Gifts} & & \\ 1 & : & 9 & = & 10\text{ units} \\ & & \downarrow \times 2.5 & & \downarrow \times 2.5 \\ & & \boxed{22.5\text{ kg}} & & 25\text{ kg} \end{array}$$

= 22500 g

10. (b)

$$\begin{array}{ccc} B & + & G = 640 \\ \downarrow & & \downarrow \\ 400 & + & G = 640 \end{array}$$

$\Rightarrow G = 240$

$\therefore G : B = 240 : 400 = 3 : 5$

11. (d) $x : y = 5 : 6$

$\Rightarrow x = 5k,\ y = 6k$

$$\therefore \frac{2x+3y}{3x+5y} = \frac{2\times5k+3\times6k}{3\times5k+5\times6k}$$

$$= \frac{10k+18k}{15k+30k} = \frac{28}{45} = 28 : 45$$

12. (a) $x : y = 1 : 2$ (Given)

$x = k,\ y = 2k$

$$\therefore \frac{2x+4y}{x+4y} = \frac{2\times k+4\times2k}{k+4\times2k}$$

$$= \frac{2k+8k}{9k} = \frac{10k}{9k} = \frac{10}{9} = 10 : 9$$

13. (c) $a : b = 5 : 7 \Rightarrow \frac{a}{b} = \frac{5}{7}$

Put value of a and b in $(6a^2 - 2b^2) : (b^2 - a^2)$,

$6a^2 - 2b^2 : b^2 - a^2$

$= 6 \times 5^2 - 2 \times 7^2 : 7^2 - 5^2$

$= 6 \times 25 - 2 \times 49 : 49 - 25$

$= 150 - 98 : 24 = 52 : 24 = 13 : 6$

14. (c) Given, $\frac{a}{b} = \frac{7}{6}$

Put a = 7k and b = 6k in the following expression–

$$\therefore \frac{6a+13b}{6a-13b} = \frac{6\times7k+13\times6k}{6\times7k-13\times6k}$$

$$= \frac{42k+78k}{42k-78k} = \frac{120k}{-36k} = -\frac{10}{3}$$

15. (a) $\because p : q = 5 : 2 = 5x : 2x$

$$\therefore \frac{p^2-q^2}{p^2+q^2} = \frac{(5x)^2-(2x)^2}{(5x)^2+(2x)^2}$$

$$= \frac{25x^2-4x^2}{25x^2+4x^2} = \frac{21}{29}$$

16. (c) $\frac{x}{4y} = \frac{3}{4} \Rightarrow \frac{x}{y} = \frac{3}{1} = \frac{3k}{k}$

$$\therefore \frac{2x+3y}{x-2y} = \frac{2\times3k+3\times k}{3k-2k} = 9$$

17. (a) $\frac{7x+y}{7x-y} = \frac{7}{2}$

Using C & D rule,

$$\frac{7x}{y} = \frac{9}{5} \Rightarrow \frac{x}{y} = \frac{9}{5\times7} = \frac{9}{35}$$

18. (b) $\frac{5x+3y}{5x-3y} = \frac{7}{3}$

Use componendo and dividendo

$$\Rightarrow \frac{5x}{3y} = \frac{10}{4} = \frac{5}{2} \Rightarrow x : y = 3 : 2$$

19. (c) $\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{5}$

$$\Rightarrow p = \frac{2}{5}q,\ r = \frac{2}{5}s,\ t = \frac{2}{5}u$$

$$\therefore \frac{(4p+3r+7t)}{(4q+3s+7u)} = \frac{\left(4\times\frac{2}{5}q+3\times\frac{2}{5}s+7\times\frac{2}{5}u\right)}{4q+3s+7u}$$

$$= \frac{\frac{2}{5}(4q+3s+7u)}{(4q+3s+7u)} = 2 : 5$$

Alternate Method

$$\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{5}$$

Let p = r = t = 2k

q = s = u = 5k

$$\therefore \frac{4p+3r+7t}{4q+3s+7u} = \frac{4\times2k+3\times2k+7\times2k}{4\times5k+3\times5k+7\times5k}$$

$$= \frac{28k}{70k} = \frac{2}{5} = 2 : 5$$

20. (c) $a : b = c : d = e : f = 5 : 7$

$$\therefore \frac{3a+5c+11e}{3b+5d+11f} = \frac{3\times5+5\times5+11\times5}{3\times7+5\times7+11\times7}$$

$$= \frac{5(3+5+11)}{7(3+5+11)} = \frac{5}{7}$$

21. (b) $x : y : z = 3 : 4 : 5$

$$\therefore \left(\frac{x}{y}\right):\left(\frac{y}{z}\right):\left(\frac{z}{x}\right)$$

$$= \left(\frac{3}{4}:\frac{4}{5}:\frac{5}{3}\right)\times60$$

= 45 : 48 : 100

22. (a) $\frac{1}{M} : \frac{1}{N} : \frac{1}{O} = 3 : 4 : 5$

$$\begin{array}{ccccc} M & : & N & : & O \\ 4\times5 & : & 3\times5 & : & 3\times4 \\ =20 & : & 15 & : & 12 \end{array}$$

23. (c) $A : B : C = 2 : 3 : 4$

$$\frac{A}{B} = \frac{2}{3},\ \frac{B}{C} = \frac{3}{4},\ \frac{C}{A} = \frac{2}{1}$$

$$\begin{array}{ccccc} \frac{A}{B} & : & \frac{B}{C} & : & \frac{C}{A} \\ \frac{2}{3} & : & \frac{3}{4} & : & \frac{2}{1} \\ =8 & : & 9 & : & 24 \end{array}$$

24. (b) Given,

$$C = \frac{2}{3}D \text{ and } D = \frac{3}{8}E$$

ATQ,

$$\frac{C}{2} : \frac{D}{3} : \frac{E}{8}$$

$\Rightarrow C : E = 2 : 8 = 1 : 4$

25. (c) 40% of A = 60% of B = $\frac{1}{6}$ of C

$$\Rightarrow \frac{2A}{5} = \frac{3B}{5} = \frac{C}{6} = K$$

$$A : B : C = \frac{5K}{2} : \frac{5K}{3} : 6K$$

$$= \frac{5}{2} : \frac{5}{3} : \frac{6}{1}$$

∴ Multiply by LCM of (2, 3, 1) = 6

A : B : C = 15 : 10 : 36

26. (d) Given, 2P = 3Q = 4R = 5S

$$\begin{array}{ccccccc} P & : & Q & : & R & : & S \\ 3\times4\times5 & : & 2\times4\times5 & : & 2\times3\times5 & : & 2\times3\times4 \\ 60 & : & 40 & : & 30 & : & 24 \\ 30 & : & 20 & : & 15 & : & 12 \end{array}$$

27. (c) Let, $15x = 24y = 32z = k$

$$\Rightarrow x = \frac{k}{15}, y = \frac{k}{24}, z = \frac{k}{32}$$

$$x : y : z = \frac{k}{15} : \frac{k}{24} : \frac{k}{32} = \frac{1}{15} : \frac{1}{24} : \frac{1}{32}$$

= 32 : 20 : 15

Alternate Method:

Directly take the LCM of (15, 24, 32) = 480

$$\begin{array}{lccccc} \text{Now,} & x & : & y & : & z \\ & \frac{480}{15} & : & \frac{480}{24} & : & \frac{480}{32} \\ \hline & 32 & : & 20 & : & 15 \end{array}$$

28. (b) ATQ,

5 × Ravi = 3 Reeta = 11 Rahul = K(let)

$$\Rightarrow \text{Ravi} = \frac{K}{5},\ \text{Reeta} = \frac{K}{3},\ \text{Rahul} = \frac{K}{11}$$

LCM of 5, 3, 11 = 165

$$\frac{K}{5} \times 165 = 33k,\ \frac{K}{3} \times 165 = 55k,$$

$$\frac{K}{11} \times 165 = 15k$$

$$\begin{array}{ccc} \underbrace{\text{Ravi}} & \underbrace{\text{Reeta}} & \underbrace{\text{Rahul}} \\ 33K & 55K & 15K \end{array}$$

Now,

Ratio = 33 : 55 : 15

Alternate Method:

$$5\times(\text{Ravi}) = 3\ (\text{Reeta}) \Rightarrow \frac{\text{Ravi}}{\text{Reeta}} = \frac{3}{5}$$

$$3(\text{Reeta}) = 11(\text{Rahul}) \Rightarrow \frac{\text{Reeta}}{\text{Rahul}} = \frac{11}{3}$$

$$\begin{array}{ccccc} \text{Ravi} & & \text{Reeta} & & \text{Rahul} \\ 3_{\times11} & : & 5_{\times11} & & \\ & & 11_{\times5} & : & 3_{\times5} \\ \hline 33 & : & 55 & : & 15 \end{array}$$

29. (a)

$$\begin{array}{ccccc} A & : & B & : & C \\ (6 & : & 8 & &)_{\times5} \\ (& & 5 & : & 10)_{\times8} \\ \hline 30 & : & 40 & : & 80 \end{array}$$

∴ Ratio → 3 : 4 : 8

30. (d) $A : B = 6 : 8 = 3 : 4$

$$\begin{array}{ccccc} A & : & B & : & C \\ 3 & : & 4 & : & 4 \\ 5 & : & 5 & : & 12 \\ \hline 15 & : & 20 & : & 48 \end{array}$$

31. (a) $A : B = 6 : 8 \Rightarrow A : B = 3 : 4$
$B : C = 7 : 10$

$$\begin{array}{ccccc} A & : & B & : & C \\ 3 & : & 4 & \rightarrow & 4 \\ 7 & \leftarrow & 7 & : & 10 \\ \hline 21 & : & 28 & : & 40 \end{array}$$

32. (d) $A : B = 6 : 8 \Rightarrow 3 : 4$
$B : C = 7 : 2$

$$\Rightarrow \begin{array}{ccccc} A & : & B & : & C \\ 3 & : & 4 & \rightarrow & 4 \\ 7 & \leftarrow & 7 & : & 12 \\ \hline 21 & : & 28 & : & 48 \end{array}$$

33. (d) $A : B = 6 : 8 = 3 : 4$

$$\begin{array}{ccccc} A & : & B & : & C \\ 3 & : & 4 & : & 4 \\ 5 & : & 5 & : & 11 \\ \hline 15 & : & 20 & : & 44 \end{array}$$

34. (a) $a : b = 3 : 7,\ b : c = 4 : 9$

$$\begin{array}{ccccc} a & : & b & : & c \\ 3 & : & 7 & \rightarrow & 7 \\ 4 & \leftarrow & 4 & : & 9 \\ \hline 12 & : & 28 & : & 63 \\ \hline \end{array}$$

35. (a) $A : B = 3 : 7,\ B : C = 2 : 5$

$$\begin{array}{ccccc} A & : & B & : & C \\ 3_{\times 2} & : & 7_{\times 2} & & \\ & & 2_{\times 7} & : & 5_{\times 7} \\ \hline 6 & : & 14 & : & 35 \\ \hline \end{array}$$

36. (b) $A : B = 5 : 8$
$B : C = 7 : 8$

$$\begin{array}{ccccc} A & : & B & : & C \\ 5_{\times 7} & : & 8_{\times 7} & & \\ & & 7_{\times 8} & : & 8_{\times 8} \\ \hline 35 & : & 56 & : & 64 \\ \hline \end{array}$$

$\therefore A : C = 35 : 64$

37. (c) Given,

$$\begin{array}{l} a : b = 2 : 3 \\ b : c = 5 : 7 \\ \hline a : c = 10 : 21 \end{array}$$

38. (b) ATQ,

$$\begin{array}{ccccccc} p & : & q & : & r & : & s \\ 4 & : & 5 & : & \textcircled{5} & : & \textcircled{5} \\ \textcircled{3} & : & 3 & : & 4 & : & \textcircled{4} \\ \textcircled{2} & : & \textcircled{2} & : & 2 & : & 5 \\ \hline 24 & : & 30 & : & 40 & : & 100 \end{array}$$

$\therefore p : s = 24 : 100 = 6 : 25$

39. (d)

$$\begin{array}{ccccc} A & : & B & : & C \\ 2_{\times 7} & : & 3_{\times 7} & & \\ & & 7_{\times 3} & : & 8_{\times 3} \\ \hline 14 & : & 21 & : & 24 \\ \hline \end{array}$$

$\therefore A : C = 14 : 24 = 7 : 12$

40. (a)

$$\begin{array}{ccccccc} P & & Q & & R & & S \\ 4 & : & 7 & : & 9 & : & 9 \\ 2 & : & 2 & : & 2 & : & 5 \\ \hline 8 & & & & & & 45 \end{array}$$

$\therefore\ P : S = 8 : 45$

41. (c)

$$\begin{array}{ccccccc} a & : & b & : & c & : & d \\ 3 & : & 4 & : & 4 & : & 4 \\ 2 & \leftarrow & 2 & : & 3 & \rightarrow & 3 \\ 5 & : & 5 & \leftarrow & 5 & : & 6 \\ \hline 30 & : & 40 & : & 60 & : & 72 \\ 15 & : & 20 & : & 30 & : & 36 \end{array}$$

42. (a)

$$\begin{array}{ccccccc} A & : & B & : & C & : & D \\ 8 & : & 13 & & \underline{13} & & \underline{13} \\ \underline{5} & & 5 & : & 8 & & \underline{8} \\ \underline{4} & & \underline{4} & & 4 & : & 5 \\ \hline 160 & : & 260 & : & 416 & : & 520 \\ 40 & : & 65 & : & 104 & : & 130 \end{array}$$

43. (c)

$$\begin{array}{ccccccc} A & & B & & C & & D \\ 5 & : & 4 & & \textcircled{4} & & \textcircled{4} \\ \textcircled{6} & & 6 & : & 5 & & \textcircled{5} \\ \textcircled{7} & & \textcircled{7} & & 7 & : & 10 \\ \hline 210 & : & 168 & : & 140 & : & 200 \end{array}$$

$$\begin{array}{ccc} A & & D \\ 210 & : & 200 \\ 21 & : & 20 \end{array}$$

44. (b) $A : B = \frac{1}{3} : \frac{1}{5} = 5 : 3$

$B : C = \frac{1}{7} : \frac{1}{8} = 8 : 7$

$C : D = \frac{1}{10} : \frac{1}{21} = 21 : 10$

$$\begin{array}{ccccccc} A & : & B & : & C & : & D \\ 5 & : & 3 & : & 3 & : & 3 \\ 8 & : & 8 & : & 7 & : & 7 \\ 21 & : & 21 & : & 21 & : & 10 \\ \hline 40\times 21 & : & 24\times 21 & : & 21\times 21 & : & 21\times 10 \end{array}$$

$A : B : C : D = 40 : 24 : 21 : 10$

45. (d) ATQ,
$P : Q = 3 : 4$
$Q : R = 4 : 7$
$P : Q : R = 3 : 4 : 7$
$\therefore (P + Q) : (Q + R) : (R + P) = 7 : 11 : 10$

46. (b)

$$\begin{array}{ccccc} (a+b) & : & (b+c) & : & (c+a) \\ 15 & : & 14 & : & 11 \end{array}$$

$2(a+b+c) = 40 \Rightarrow (a+b+c) = 20$
20 unit → 40
1 unit → 2
$c = 5$ unit → 10
$a = 6$ unit → 12
$b = 9$ unit → 18
$\therefore (3a + b - 4c) = 36 + 18 - 40 = 14$

47. (b) ATQ,

$$\begin{array}{r} a^2 + b^2 = 34k^2 \\ b^2 + c^2 = 61k^2 \\ c^2 + a^2 = 45k^2 \\ \hline 2(a^2 + b^2 + c^2) = 140k^2 \end{array}$$

$a^2 + b^2 + c^2 = 70k^2$
$a^2 = 70k^2 - 61k^2 = 9k^2 \Rightarrow a = 3k$
$b^2 = 70k^2 - 45k^2 = 25k^2 \Rightarrow b = 5k$
$c^2 = 70k^2 - 34k^2 = 36k^2 \Rightarrow c = 6k$
Now, $b - a = 5k - 3k = 2k$
$c - b = 6k - 5k = k$
$c - a = 6k - 3k = 3k$
$\therefore$ Required ratio $= 2 : 1 : 3$

48. (b) $K^2 : M :: M : 16$

$\Rightarrow \frac{K^2}{M} = \frac{M}{16} \Rightarrow 16K^2 = M^2 \Rightarrow 4K = M$

$\Rightarrow \frac{K}{M} = \frac{1}{4}$

$\therefore \frac{K^2 + 2M^2}{K^2 + M^2} = \frac{(1+32)}{1+16} = \frac{33}{17}$

49. (a) Given, $\frac{x^2}{y^2} = \frac{16}{81}$

Since, x and y have opposite sings.

Case I : $\frac{x}{y} = \frac{-4}{9},\ x = -4,\ y = 9$

$\therefore \frac{3x + 4y}{2x - 3y} = \frac{-12 + 36}{-8 - 27} = \frac{-24}{35}$

Case II : $\frac{x}{y} = \frac{4}{-9},\ x = 4,\ y = -9$

$\therefore \frac{3x + 4y}{2x - 3y} = \frac{12 - 36}{8 + 27} = \frac{-24}{35}$

50. (c) Let the numbers are x and y.
ATQ,
$x + y = 9(x - y) \Rightarrow x + y = 9x - 9y$

$\Rightarrow \frac{x}{y} = \frac{5}{4}$

51. (b) $\because$ Income = Expenditure + Savings
ATQ,

$\Rightarrow \frac{I}{S} = \frac{8x}{x}$

$\therefore$ Expenditure $= 7x$
ATQ,

$\frac{\text{Expenditure}}{\text{Savings}} = \frac{7x}{x} = \frac{7}{1}$

$\therefore$ His expenditure is 7 times his savings.

52. (b) Total pets = 2 + 3 + 4 = 9
Rabbits = 3
$\therefore$ Required Ratio $= 3 : 9$
$= 1 : 3$

53. (a) $20\% = \frac{1}{5}\Big) + \begin{array}{l} 6 \rightarrow \text{Boys} \\ 5 \rightarrow \text{Girls} \end{array}$

$\therefore$ Ratio of Boys to Girls $= 6 : 5$.

54. (c) For greater ratio.

$\frac{7}{4} = 1.75,\ \frac{2}{3} = 0.66,\ \frac{8}{3} = 2.66,$

$\frac{1}{5} = 0.2$

$\therefore 8 : 3$ is the greater ratio.

Alternate Method:

LCM of 3, 4, 5 = 60

$\frac{7}{4} \times 60 = 105,\ \frac{2}{3} \times 60 = 40,$

$\frac{8}{3} \times 60 = 160,\ \frac{1}{5} \times 60 = 12$

$\therefore \frac{8}{3}$ is largest among all.

55. (a) With the help of basic division.

$\frac{41}{92} = 0.44,\ \frac{33}{41} = 0.80,$

$\frac{42}{49} = 0.85 \Rightarrow \frac{35}{47} = 0.74$

Hence, Smallest fraction is 41 : 92.

SMART APPROACH:-
Higher the difference between antecedent and consequent, the smaller the ratio.
Hence, Answer (a)

56. (d) $\frac{3}{4} = 0.75,\ \frac{5}{8} = 0.625,\ \frac{1}{2} = 0.50,$

$\frac{6}{9} = 0.67$

$\therefore \frac{3}{4}$ is largest among all.

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Alternate Method:

LCM of 4, 8, 2, 9 = 72

$\frac{3}{4} \times 72 = 54,\ \frac{5}{8} \times 72 = 45,\ \frac{1}{2} \times 72 = 36,\ \frac{6}{9} \times 72 = 48$

$\therefore \frac{3}{4}$ is largest among all

57. (d)

	Hens	:	Cows		Ratio
Ram →	12	:	5	=	2.4
Shyam →	18	:	9	=	2
Preetham →	4	:	8	=	0.5
Vinay →	10	:	7	=	1.4

∴ Ram has greatest ratio of hens to cows.

58. (c) Let, Sarita has ₹'S' & Rishi has ₹'R'

S + R = ₹ 4760

A.T.Q.,

$\therefore \frac{9}{16}R = \frac{3}{4}S \Rightarrow \frac{R}{S} = \frac{4}{3}$

⇒ (4 + 3) units → ₹4760

3 units → ₹$\frac{4760}{7} \times 3 = 680 \times 3$

= ₹2040

59. (a) ATQ,

$\frac{3}{10}$ of Adi = $\frac{3}{5}$ of Dia

$\frac{\text{Adi}}{\text{Dia}} = 2:1$

3 unit = 1440

1 unit = 480

Dia 1 unit = 480

60. (d) Let, Ist number = x

IInd number = $37 - x$.

A.T.Q.

$5x + 11(37 - x) = 227$

$\Rightarrow 5x + 407 - 11x = 227 \Rightarrow x = 30 \therefore$ Smaller number = 37 – 30 = 7 ∴ 9 times of smaller number = 7 × 9

= 63.

61. (c) $P : Q : R = 5 : 3 : 4$

1 unit = 1500

Q = 3 unit = 3 × 1500 = 4500

62. (c) A : B = 3 : 4

B : C = 4 : 5

A : B : C = 3 : 4 : 5

5 – 3 = 2unit → 30

∴ 4unit → 60

63. (c) P : Q : R : S

4 : 9 : 2 : 3

7 unit → Rs. 560

1 unit → Rs. 80

∴ 3 unit → Rs. 3 × 80 = 240

∴ Share of S = Rs. 240

64. (a)

$$\begin{array}{ccccccc} A & : & B & : & C & : & D \\ 1 & : & 2 & & \boxed{2} & & \boxed{2} \\ \boxed{3} & & 3 & : & 1 & & \boxed{1} \\ \boxed{2} & & \boxed{2} & & 2 & : & 3 \\ \hline 6 & : & 12 & : & 4 & : & 6 \\ 3 & : & 6 & : & 2 & : & 3 \end{array}$$

∴ A : B : C : D = 3 : 6 : 2 : 3

⇒ (3 + 6 + 2 + 3) units = 875

14 units → 875

2 units → 125

∴ C's value = 125

65. (d) Given,

$$\begin{array}{ccccccc} \underline{A} & & \underline{B} & & \underline{C} & & \underline{D} \\ 3 & : & 2 & \rightarrow & 2 & : & 2 \\ 9 & \leftarrow & 9 & : & 8 & \rightarrow & 8 \\ 4 & \leftarrow & 4 & \leftarrow & 4 & : & 3 \\ \hline 108 & : & 72 & : & 64 & : & 48 \end{array} = 292 \text{ (Total)}$$

Diff. (72 – 48)

24 unit = 708

1 unit = $\frac{59}{2}$

Total sum (x) = $\frac{59}{2} \times 292$ = ₹8614

66. (b)

$$\begin{array}{ccccc} P & : & Q & : & R \\ 1 & : & 2 & : & \underline{2} \\ \underline{3} & : & 3 & : & 2 \\ \hline 3 & : & 6 & : & 4 \end{array}$$

A.T.Q,

$\frac{3x}{3} + 4400 = \frac{3x}{2}$

$\Rightarrow \frac{x}{2} = 4400 \Rightarrow x = 8800$

Now, Q = 8800 × 6 = 52800

67. (d)

$$\begin{array}{ccccc} A & : & B & : & C \\ 7 & : & 12 & & \\ & & 8 & : & 5 \\ \hline 56 & : & 96 & : & 60 \end{array} = 212 \text{ unit}$$

Diff. (56 – 60)

4 unit → 214

1 unit → 53.5

∴ x (212 unit) → 11342

68. (d) A : B = 5 : 9

C : D = 24 : 13

$\downarrow \quad \downarrow \times 100$

$\boxed{2400}$ 1300

Price of B = 2400 – 1500 = 900

9 unit = 900

∴ A (5 unit) = 500

69. (d)

$$\begin{array}{ccccc} A & : & B & : & C \\ \frac{3}{2} \times 15 & : & \frac{6}{5} \times 6 & : & \frac{4}{3} \times 10 \\ \text{Salary} \rightarrow 45 & : & 36 & : & 40 \end{array}$$

Diff.

5

Required % = $\frac{5}{40} \times 100 = 12.5\%$

SMART APPROACH:-

$$\begin{array}{ccc} A & : & C \\ \frac{3}{2} & : & \frac{4}{3} \\ \text{Salary} \rightarrow 9 & : & 8 \end{array}$$

Diff.

1

Required% = $\frac{1}{8} \times 100 = 12.5\%$

70. (c) Given, Ratio = $\frac{4}{5} : \frac{5}{6} : \frac{9}{10}$

[L.C.M of (5, 6, 10) = 60]

$\Rightarrow \frac{4}{5} \times 60 : \frac{5}{6} \times 60 : \frac{9}{10} \times 60$

= 48 : 50 : 54 ⇒ 24 : 25 : 27

ATQ,

3 unit = 12 ⇒ 1 unit = 4

∴ The number which is neither the smallest nor the greatest is

= 25 × 4 = 100

71. (d) Jeeven : Praveen = 5 : 8

Praveen : Kanan = 3 : 2

$$\begin{array}{ccccc} \text{Jeevan} & : & \text{Praveen} & : & \text{Kanan} \\ 5 & : & 8 & : & 8 \\ 3 & : & 3 & : & 2 \\ \hline 15 & : & 24 & : & 16 \end{array}$$

55 unit → 17600

∴ 15 unit → 4800

72. (d)

$$\begin{array}{ccccccc} A & & B & & C & & D \\ 1 & : & 3 & & ③ & & ③ \\ ② & & 2 & : & 5 & & ⑤ \\ ② & & ② & & 2 & : & 3 \\ \hline 4 & : & 12 & : & 30 & : & 45 \end{array} = 91$$

Diff. = 33

33 units → 6435

1 unit → 195

∴ Total sum = 91 × 195 = ₹17745

73. (d)

$$\begin{array}{ccccc} \underline{\text{Cyrus}} & & \underline{\text{Rohan}} & & \underline{\text{Mishti}} \\ 3 & : & 2 & & \\ & & 7 & : & 12 \\ \hline 21 & : & 14 & : & 24 \end{array}$$

Difference

∵ 3 units → 1800

∴ 14 units → $\frac{1800}{3} \times 14$ = ₹8400

74. (a) A : B : C : D

4 : 12 : 30 : 45 = 91

Diff.

41 unit → 5535

1 unit → 135

$\downarrow \times 135$

12285

75. (c)

$$\begin{array}{ccccc} B & : & A & : & C \\ \underline{4} & : & 4 & : & 15 \\ 5 & : & 2 & : & \underline{2} \\ \hline 20 & : & 8 & : & 30 \\ 10 & : & 4 & : & 15 \end{array} = 29$$

Diff.

$\downarrow \times 448$

12992

5 unit = 5×448

= 2240

Note:- In the end, there is no need of calculation instead, we know we want value of 5 → options has to be a multiple of 5 which option (c) only.

76. (c)

$$\begin{array}{ccccc} \text{Cricket} & : & \text{Football} & : & \text{Hockey} \\ [27 & : & 13]_{\times 2} & & \\ & & 26 & : & 14 \\ \hline 54 & : & 26 & : & 14 \end{array}$$

∴ Percentage of students playing cricket = $\frac{54}{54+26+14} \times 100$

$= \frac{54}{94} \times 100 = 57.447 \sim 57.45\%$

77. (b) ATQ,

$\frac{A}{B+C} = \frac{9}{17} > 26 \times 1$

and

A + B + C = 26

$\frac{C}{A+B} = \frac{5}{8} > 13 \times 2 \Rightarrow \frac{C}{A+B} = \frac{10}{16}$

Where,

$\frac{\mathbf{A}}{9} \quad \frac{\mathbf{B}}{7} \quad \frac{\mathbf{C}}{10}$

B : C = 7 : 10

78. (b) $\frac{C}{A+B+C+D}=\frac{1560}{6300}=\frac{26}{105}$

$\frac{A+D}{B+C}=\frac{11}{10}$ $\xrightarrow{\times 5}$ 55, $\xrightarrow{\times 5}$ 50

(+) 21 unit = 105
1 unit = 5

Where, C = 26
B = 50 − 26 = 24

ATQ,

$\frac{B}{D}=\frac{8}{9}\xrightarrow{\times 3}\frac{24}{27}$

D = 27 ⇒ A = 55 − 27 = 28

Sequence,

$$\begin{array}{cccc} A & B & C & D \\ \downarrow & \downarrow & \downarrow & \downarrow \\ 28 & 24 & 26 & 27 \end{array} = 105 \text{ unit}$$

105 unit = 6300
1 unit = 60
Difference between the share of A and B = 4 unit = 4 × 60 = 240

79. (d) Sum = 46,800

$\frac{B}{C}=\frac{5}{4}=\frac{5\times5}{4\times5}=\frac{25}{20}$

$\frac{A+D}{B+C}=\frac{8}{5}=\frac{8\times9}{5\times9}$

$=\frac{72}{45}$ $\xrightarrow{\times 400}$ 28800, $\xrightarrow{\times 400}$ 18000

(+) 117 unit = 46800
1 unit = 400

A's share = 18,400
D's share = 28,800 −18,400 = 10,400
45 unit = 18000
25 unit = 10000
B's share = 10000
C's share = 8000
x ⇒ A − B = 8,400
y ⇒ C − D = 2,400
∴ x − y = 6,000

80. (b) Given,

$B+D=\frac{14}{11}(A+C)$

$\Rightarrow\frac{B+D}{A+C}=\frac{14}{11}$ $\xrightarrow{\times 50}$ 700, $\xrightarrow{\times 50}$ 550

(+) 25 unit = 1250
1 unit = 50

Also, $D=\frac{1}{2}A$, C = 1.2A
∵ A + C = 550
⇒ 2.2A = 550
⇒ A = 250
⇒ C = 300
Also D = 125 & B = 700 − 125
= 575

81. (b)

$$\begin{array}{ccccc} I^{st} \text{ no.} & : & II^{nd} \text{ no.} & : & III^{rd} \text{ no.} \\ 130 & : & 140 & : & 100 \end{array}$$

$100 \xrightarrow{+40\%} 140$, $100 \xrightarrow{+30\%} 130$

Req. ratio = 140 : 130 = 14 : 13

82. (a) Let the total land that Sonu have = 100 unit

$\text{Sonu} \xrightarrow{+15\%} \text{Raju}$, $\text{Sonu} \xrightarrow{+25\%} \text{Ramu}$

$$\begin{array}{ccccc} \text{Sonu} & & \text{Raju} & & \text{Ramu} \\ 100 & : & 115 & : & 125 \\ & & 23 & : & 25 \end{array}$$

∴ Req. ratio = 23 : 25

83. (d) Let, the third number = 100
Now,

$$\begin{array}{ccccc} I^{st}\text{no.} & : & II^{nd}\text{no.} & : & III^{rd}\text{no.} \\ 160 & : & 130 & : & 100 \end{array}$$

$100 \xrightarrow{+30\%} 130$, $100 \xrightarrow{+60\%} 160$

∴ Ratio of two no. = 130 : 160
= 13 : 16

84. (d) ATQ,

$6\% A + 4\% B = \frac{2}{5}(7\% A + 11\% B)$
⇒ 30A + 20B = 14A + 22B
⇒ 16A = 2B
⇒ A : B = 1 : 8

85. (b) Total dividend = $\frac{1}{10}\times 44000\times\frac{10}{100}+\frac{4}{10}\times 44000\times\frac{3}{20}+\frac{5}{10}\times 44000\times\frac{1}{4}$
= 440 + 2640 + 5500 = 8580

86. (d) Let the income of B, C, D, & E are, 200, 300, 400 & 500 respectively

$$\begin{array}{lccccccc} & B & : & C & : & D & : & E \\ \text{Old} \rightarrow & 200 & : & 300 & : & 400 & : & 500 \\ & \downarrow{\scriptstyle +20\%} & & \downarrow{\scriptstyle +30\%} & & \downarrow{\scriptstyle +40\%} & & \downarrow{\scriptstyle +50\%} \\ \text{New} \rightarrow & 240 & : & 390 & & 560 & & 750 \\ & & & & & \downarrow & & \\ & & & & & 560 & & \end{array}$$

Total = 200 + 300 + 400 +500
= 1400

87. (c)

$$\begin{array}{lccccc} & \text{Maths} & : & \text{Physics} & : & \text{Chemistry} \\ & 8 & : & 5 & : & 9 \\ \text{Original} \rightarrow & 800 & : & 500 & : & 900 \\ & \downarrow{\scriptstyle +10\%} & & \downarrow{\scriptstyle +5\%} & & \downarrow{\scriptstyle +5\%} \\ \text{New} \rightarrow & 880 & : & 525 & : & 945 \\ \hline \text{Ratio} \rightarrow & 176 & : & 105 & : & 189 \end{array}$$

The ratio of number of book after increment = 176 : 105 : 189 .

88. (c) A : B : C
2 : 1 : 3 = 6 unit

$\downarrow \times 200$

1200

ATQ,
(3 × 3) + (2 × 1) = 11 unit
∴ 11 unit → ₹ 2200

89. (d) Let, the four number be a, b, c & d.
Given that, a : b : c : d
= 1 : 2 : 3 : 5
According to question,
2(a + b + c + d) = 44
2(1 + 2 + 3 + 5) units = 44
1 units = 2
a = 2, b = 4, c =6, d = 10
$a^3 - 3 = 5$, $b^3 - 3 = 61$, $c^3 - 3 = 213$,
$d^3 - 3 = 997$
Hence, The required ratio
= 5 : 61 : 213 : 997

90. (a) ATQ
3C + 5P = 1080 $\times 2$ ......(i)
2C + 4P = 840 $\times 3$ ......(ii)
Subtracting (i) from (ii)

$$\begin{array}{r} 6C+10P=2160 \\ 6C+12P=2520 \\ \hline 2P=360 \\ P=180 \end{array}$$

2C + 4P = 840 ⇒ 2C + 720 = 840
⇒ 2C = 120 ⇒ C = 60
Ratio = 60 : 180 = 1 : 3

91. (b) Let, hens = x
⇒ goats = y
A.T.Q,
x + y = 100 ......(i)
2x + 4y = 348 ......(ii)
Solving (i) and (ii)
y = 74

Alternate Method:

$$\begin{array}{lccc} & \text{Hens} & & \text{Goat} \\ \text{Legs} \rightarrow & 200 & & 400 \\ & & 348 & \\ & 52 & & 148 \\ & 13 & : & 37 \end{array}$$

sum

50 unit = 100
37 unit = 74

92. (b) Let, Required number to be added is k

So, $\frac{5+k}{11+k}=\frac{3}{5}$
⇒ 2k = 8 ⇒ k = 4

Alternate Method:

diff.
5 : 11 → 6
3 : 5 → $2_{\times 3}$ ⇒ 5 : 11, 9 : 15 (+4)
∴ 4 must be added

93. (d) ATQ,

$\frac{19x+2000}{17x+1000}=\frac{8}{7}$
⇒ 133x + 14000 = 136x + 8000
⇒ 3x = 6000 ⇒ x = 2000
Present salary of kumud after increment = 17x + 1000
= 17 × 2000 + 1000
= 35000

94. (a) ATQ,

$\frac{2x+200}{3x}=\frac{5}{6}\Rightarrow 12x+1200=15x$
⇒ 3x = 1200 ⇒ x = 400
∴ No of Female members
= 3x = 3 × 400 = 1200

Alternate Method:-

$$\begin{array}{ccccccc} M & : & F & & M & : & F \\ 2 & : & 3_{\times 2} & \rightarrow & 4 & : & 6 \\ 5 & : & 6 & & 5 & : & 6 \end{array}$$

1 unit = 200
∴ 6 unit = 1200

95. (b) Given, $\frac{M}{W}=\frac{5}{3}=\frac{5x}{3x}$

and, $\frac{5x}{3x+150}=\frac{5}{4}$

$\Rightarrow 20x = 15x + 750$
$\Rightarrow 5x = 750 \Rightarrow x = 150$
$\therefore$ M = $5x = 5 \times 150 = 750$

Alternate Method:

M : W
Old → 5 : 3 $\overset{+1}{\curvearrowright}$
New → 5 : 4
1 unit → 150
5 unit → 750
$\therefore$ No. of men = 750

96. (a)
Gold coin : Non-gold Coin
x $4x$
ATQ,

$$\frac{x+20}{4x} = \frac{2}{3}$$

$\Rightarrow 3x + 60 = 8x$
$\Rightarrow x = 12$
Now, total no. of coins = $x + 4x + 20$
$= 5x + 20$
$= 5 \times 12 + 20 = 80$

Alternate Method:

Gold coin : Non-gold coin
$1_{\times 3}$: $4_{\times 3}$
$2_{\times 4}$: $3_{\times 4}$
3 : 12
8 : 12
(3 → 8: 5)
5 unit → 20
1 unit → 4
$\therefore$ Now, total no. of Conis
= (3 + 12) unit + 20
= 15 × 4 + 20 = 80

97. (c) Let, newly admitted girls be x.
Total → 1650 (← ×150)
Boys : Girls
6 : 5 = 11
↓×150 ↓×150
900 750
New admitted 124 x
New ratio 4 : 3
4 unit → (900 + 124) = 1024
3 unit = 768
Newly admitted girls = 768 – 750 = 18
So, ratio = 18 : 124 = 9 : 62

98. (b) ATQ,

Total
Before increase → 2 : 3 : 5 = 10
2↓ 2↓ 2↓
After increase → 4 : 5 : 7 = 16
2 unit → 20
1 unit → 10
Students before increase
= 10 × 10 = 100

99. (c)

Ayush Weight	Abhishek Weight	Total Weight
80	50	130
	↓ 140%	↓ 160%
(208 – 70) → 138	70	208

Now, 208 units → 104 kg.
$\Rightarrow$ 1 units → $\frac{1}{2}$ kg.
$\therefore$ Ayush Weight (138 unit)
$= \frac{1}{2} \times 138$ kg = 69 kg.

100.(a)
+4 (3 → 7)
3 : 7
7 : 20
+13 (7 → 20)
Diff. must be equal
$(3 : 7)_{13}$
$(7 : 20)_{4}$
39 : 91 $\overset{11}{\curvearrowright}$
28 : 80
11 → 11 unit
$\therefore$ 39 → 39 unit
Note:- First we see multiple of 3 and after subtracting 11 multiple of 7 also.

Alternate Method:-
Let no. are $3x$ and $7x$
ATQ,

$$\frac{3x-11}{7x-11} = \frac{7}{20} \Rightarrow 60x - 220 = 49x - 77$$

$\Rightarrow 11x = 143 \Rightarrow x = 13$
$\therefore$ Smaller no. = 13 × 3 = 39

101. (c) ATQ,

$$\frac{4x+3}{5x-7} = \frac{1}{1}$$

$\Rightarrow 4x + 3 = 5x - 7$
$\Rightarrow x = 10$
$\therefore$ No. = 4 × 10 = 40 and 5 × 10 = 50

Alternate Method:
By option (c)
40 + 3 = 43 and 50 – 7 = 43
Ratio = 1 : 1 (satisfy)

102.(a) ATQ,

$$\frac{3x-40}{2x+40} = \frac{2}{3}$$

$\Rightarrow 9x - 120 = 4x + 80$
$\Rightarrow 5x = 200 \Rightarrow x = 40$
Initial no. of boys in college = 3 × 40
= 120

Alternate Method:-
Boys : Girls
3 : 2
2 : 3
(2 → 3) 1 unit = 40
$\therefore$ Initial no. of boys in college
= 3 × 40 = 120

103. (c) ATQ,

$$\frac{5x-40}{6x+50} = \frac{8}{11}$$

$\Rightarrow 55x - 440 = 48x + 400$
$\Rightarrow 7x = 840 \Rightarrow x = 120$
No. of girls initially = $6x$
= 6 × 120 = 720

SMART APPROACH:-
No. of girls initially is the multiple of 6.
only option (c) is the multiple of 6.
$\therefore$ No. of girls initially = 720

104. (c)
diff.
4 : 5 = $1_{\times 3}$ ⇒ 12 : 15
11 : 14 = $3_{\times 1}$ ⇒ 11 : 14
1 unit = 17
12 unit = 17 × 12 = 204
15 unit = 17 × 15 = 255
By adding 20
(204 + 20) : (255 + 20) = 224 : 275

105. (a)
720 (← ×90)
Boys : Girls
3 : 5 = 8
↓×90 ↓×90
270 450
ATQ, 3 unit = 468
$\Rightarrow$ 2 unit = 312
$\therefore 270 + x = 312$
$\Rightarrow x = 312 - 270 = 42$

106. (c) Parrot : Pigeon : Sparrow
$7x - 8$ $9x + 6$ 10

$$\text{ATQ,} \quad \frac{7x-8}{9x+6} = \frac{1}{4} \ \text{[Given]}$$

$\Rightarrow 28x - 32 = 9x + 6$
$\Rightarrow 19x = 38 \Rightarrow x = 2$

Parrot		Pigeon		Sparrow
$7x - 8$	:	$9x + 6$	:	10
6	:	24	:	10

$\therefore$ Required ratio = 6 : 10 = 3 : 5

107.(b)

$$\frac{\text{Total}}{\text{Failed}} = \frac{29x+1}{4x-3} = \frac{25}{3}$$

$\Rightarrow 87x + 3 = 100x - 75$
$\Rightarrow 13x = 78 \Rightarrow x = 6$
Initially no. of passed students
= 25 × 6 = 150
Initially no. of failed students
= 4 × 6 = 24
Difference = 150 – 24 = 126

Alternate Method:

$$\frac{\text{Pass}}{\text{Fail}} = \frac{25x+1+3}{4x-3} = \frac{22}{3}$$

$\Rightarrow 75x + 12 = 88x - 66$
$\Rightarrow 13x = 78 \Rightarrow x = 6$
Initially no. of passed students
= 25 × 6 = 150
Initially no. of failed students
= 4 × 6 = 24
$\therefore$ Difference = 150 – 24 = 126

108. (d) Let no. of coin of ₹5 = x & ₹1 = y
Total no. of coin (x + y) = 180 .... (i)
and their value (5x + y) = 500 .... (ii)
from eqn. (ii) & (i) we get
$4x = 320 \Rightarrow x = 80$

Alternate Method:

Rs.5 coins value Rs.1 coins value
5 × 180 1 × 180
= 900 = 180
500
320 : 400
4 : 5 = 9
↓×20 ↓×20
$\boxed{80}$ 180

109. (d)

Denomination → 50P 25P 20P

$= \frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{5}$

No. of coins → 2 : 3 : 5

Total value → $1 \quad \frac{3}{4} \quad 1 = \frac{11}{4}$

ATQ,

$\frac{11}{4}$ unit → 550 ⇒ 1 unit → 200

∴ Difference between amount contributed by 50P & 20P = ₹0

Alternate Method:

Denomination → 50P 25P 20P

$= \frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{5}$

No. of coins → 2 : 3 : 5

Total value → $1 \quad \frac{3}{4} \quad 1 = \frac{11}{4}$

We do not need to calculate because the difference between the total value of 50 paise and 20 paise is 0.

110. (c)

Denomination → Rs. 1 Rs. 0.50 Rs. 0.25

No. of coins → 3 : 4 : 6

Amount → 3 2 1.5 = 6.5 unit

Now,

6.5 unit → ₹143

2 unit → ₹44

∴ No. of ₹ 0.50 paisa coins = $\frac{44}{0.5} = 88$

111. (d) Let, number of coins of Rs.5 and Rs.2 respectively be x and y

Denomination → ₹5 : ₹2 : ₹1

No. of coins → $\boxed{x}$: y : $40 - x - y$

Value → $5x$: $2y$: $40 - x - y$

ATQ,

$5x + 2y + 40 - x - y = 100$

$\Rightarrow 4x + y = 60$

Use option (d) $x = 13$ satisfy

∴ Rs.5 number of coins = 13

112. (b) Denominations → ₹1 : ₹5 : ₹10

No. of coins → 3 : 5 : 7

value → 3 : 25 : 70

(3 + 25 + 70) unit = Rs.980

70 unit = $\frac{980}{98} \times 70 = 700$

∴ No. of Rs.10 coins = $\frac{700}{10} = 70$

113. (d)

Denomination → ₹10 : ₹5 : ₹2

No. of coins → x : y : $25 - x - y$

Amount → $10x : 5y : 50 - 2x - 2y$

ATQ,

$10x + 5y + 50 - 2x - 2y = 120$

$\Rightarrow 8x + 3y = 70$

From option:

(a) $x = 6 \Rightarrow y =$ non-integer ⇒ not possible

(b) $x = 4 \Rightarrow y =$ non-integer

(c) $x = 10 \Rightarrow y =$ negative (not possible)

(d) $x = 8 \Rightarrow y = \frac{6}{3} = 2 \Rightarrow$ Possible

114. (a)

Denomination → Rs.2 : Rs.5 : Rs.10

No. of coins → $5x$: $2x$: $50 - 7x$

Amount → $10x$: $10x$: $500 - 70x$

ATQ,

$10x + 10x + 500 - 70x = 150$

$\Rightarrow 50x = 350 \Rightarrow x = 7$

∴ No of Rs.10 coins = 50 − 7 × 7 = 1

115. (c)

Denomination → 25P 50P Rs.2 Rs.5

No. of coins → 5 : 4 : 3 : 1

Total value → 1.25 : 2 : 6 : 5

Total value = 14.25 unit → 285

1 unit → 20

∴ Difference between no. of 25 paisa and ₹ 5 coin = 20 × 4 = 80

116. (c) Remaining amount = ₹(100 − 20)

= ₹80

Denomination → Rs.2 : Rs.5 : Rs.10

Number of coins → 5 : 4 : 1

Value/Amount → 10 : 20 : 10

$(10 + 20 + 10)x =$ Rs.80

$\Rightarrow 40x = 80 \Rightarrow x = 2$

∴ No. of Rs.5 coins = 4 × 2 = 8

117. (a) Denomination → Rs.20 Rs.10

No. of notes → x y

ATQ,

$20x + 10y = 390$ ....(i)

$10x + 20y = 300$ ....(ii)

(i) + (ii)

$\Rightarrow x + y = 23$ ....(iii)

(i) − (ii)

$\Rightarrow x - y = 9$ ....(iv)

From (iii) & (iv),

∴ $x = 16$

∴ No. of notes of ₹20 denomination = 16.

118. (d) Pooja : Chameli : Anju

$x + 50 : x : 2x + 100$

$4x + 150 = 450$

$\Rightarrow 4x = 300 \Rightarrow x = 75$

Pooja, Chameli and Anju have = ₹125, ₹75 and ₹250

119. (d)

Denomination → ₹5 : ₹10 : ₹20

No. of coins → 3 : 5 : 7

Amount → 15 : 50 : 140 → 205 unit

$15 \xrightarrow{\times 9} \boxed{135}$ $\qquad 205 \xrightarrow{\times 9} 1845$

∴ The total worth of the smallest coins = ₹135.

120. (b) Let ₹ 10 coins be x.

Denomination → Rs.2 Rs.5 Rs.10

No. of coins → $(x+8)\frac{5}{4}$: $x + 8$: x

ATQ,

$\Rightarrow 2(x + 8)\frac{5}{4} + 5(x + 8) + 10x = 270$

$\Rightarrow 5x + 10x + \frac{5}{2}x = 210$

$\Rightarrow 35x = 420 \Rightarrow x = 12$

∴ The number of ₹5 coins = $(x + 8)$

= 12 + 8 = 20.

121. (d)

Denomination → Rs.5 Rs.10 Rs.20

No. of coins → 2 : 3 : 5

Value → 10 : 30 : 100

When 10 coins then value = 140

When 240 coins then value = 14 × 240 = 3360

Alternate Method:

No. of coins →

Rs.5 : Rs. 10 : Rs.20

2 : 3 : 5 → $10 \xrightarrow{\times 24} 240$

↓24 ↓24 ↓24

48 : 72 : 120

Amount = (48 × 5) + (72 × 10) + (120 × 20)

= 240 + 720 + 2400 = 3360

122. (c) Income : Exp.

7 : 3

$7 \xrightarrow{\times 1800} \boxed{12600}$ $\qquad 3 \xrightarrow{\times 1800} 5400$

123. (b)

Income Exp.

A → $4_{\times 2} = 8$ 7 (Diff. 1)

B → $5_{\times 2} = 10$ 9 (Diff. 1)

1 unit → 50

8 unit → 8 × 50 = 400

∴ 10 unit → 10 × 50 = 500

Alternate Method:

A : B

Income → 4 5

Expenditure → 7 9

Saving → 50 50

$(9 \times 4)x - (7 \times 5)x = 9 \times 50 - 7 \times 50$

$\Rightarrow x = 450 - 350 = 100$

∴ Monthly income of A and B = ₹400, ₹500

124. (c)

	Exp.	Savings	Income
Initial →	4	3	7
	↓	↓	↓
Final →	2.6	$3 + \frac{7}{5} = 4.4$	7

Ratio of New Expenditure : Savings = 2.6 : 4.4 = 13 : 22

125. (a)

Anand : Bharath

Income → 3 5

Expenditure → 1 3

Saving → 10000 10000

$(3 \times 3)x - (5 \times 1)x$

$= (3 \times 10000 - 1 \times 10000)$

$\Rightarrow 4x = 20000$

$\Rightarrow x = 5000$

∴ Annual income of bharath = 5 × 5000 = 25000

126. (b) Given

P : Q : R

Income → (10 : 12 : 9) ×5×4=20

Exp. → (12 : 15 : 8) ×4×3=12

Saving = 25% = $\frac{1}{4}$

(Income : Exp. = 4 : 3)

	P	Q	R
Income →	200	240	180
Exp. →	144	180	96
Saving →	56	60	84
=	14	15	21

Note: First we equate the value of Q in income and expenditure, then we divide Q in ratio of 4 : 3.

Alternate Method:

$$\begin{array}{rccccc} & P & : & Q & : & R \\ \text{Income} \rightarrow & 10x & : & 12x & : & 9x \\ \text{Exp.} \rightarrow & 12y & : & 15y & : & 8y \end{array}$$

ATQ, $12x - 15y = \frac{1}{4} \times 12x$

$\Rightarrow 9x = 15y \Rightarrow \frac{x}{y} = \frac{5}{3}$

$$\begin{array}{rccccc} & P & : & Q & : & R \\ \text{Income} \rightarrow & 50 & : & 60 & : & 45 \\ \text{Exp.} \rightarrow & 36 & : & 45 & : & 24 \\ \hline \text{Savings} \rightarrow & 14 & : & 15 & : & 21 \end{array}$$

127. (b) Let salaries of P and Q is P and Q respectively.
∵ They save 60% and 40%, and their expenditures are same.
ATQ,
P × 40% = Q × 60%

$\Rightarrow \frac{P}{Q} = \frac{3}{2}$

$\Rightarrow P : Q = 3 : 2$

Note: There is no need of actual salaries.

128. (b)

$$\begin{array}{rccccc} & \text{Income} & : & \text{Exp.} & : & \text{Saving} \\ P \rightarrow & 100x & : & 36x & : & 64x \\ Q \rightarrow & 100y & : & 56y & : & 44y \end{array}$$

ATQ,

$\frac{36x}{56y} = \frac{3}{2} \Rightarrow \frac{x}{y} = \frac{7}{3}$

$\therefore x : y = 7 : 3$

129. (a)

$$\begin{array}{rccc} & \text{Income} & \text{Exp.} & \text{Savings} \\ \text{Initial} \rightarrow & 26500 & 22000 & 4500 \\ & \downarrow{+20\%} & \downarrow{+15\%} & \downarrow \; 2000 \\ \text{Final} \rightarrow & 31800 & 25300 & 6500 \end{array}$$

$\therefore$ Increase in savings $= \frac{2000}{4500} \times 100$

$= 44\frac{4}{9}\%$

130. (a) Avinash's Savings = 50,000–18000 = ₹32,000
Radha's Savings = 60,000 – 24,000
= ₹36,000
∴ Required Ratio = 36000 : 32000
= 9 : 8

131. (c)

$$\begin{array}{rccccc} & A & : & B & : & C \\ \text{Income} \rightarrow & (2 & : & 9 & : & 3)_{\times 3} \\ \text{Exp.} \rightarrow & 3 & : & 9 & : & 5 \end{array}$$

A's saving is half of his income

$$\begin{array}{rccccc} & A & : & B & : & C \\ \text{Income} \rightarrow & 6 & : & 27 & : & 9 \\ \text{Exp.} \rightarrow & 3 & : & 9 & : & 5 \\ \hline \text{Saving} \rightarrow & 3 & : & 18 & : & 4 \end{array}$$

132. (d)

$$\begin{array}{rccc} & A & : & B \\ \text{Income} \rightarrow & 4 & : & 3 \\ \text{Exp.} \rightarrow & \frac{5}{12} \times 4 & : & \frac{7}{15} \times 3 \\ & = \frac{5}{3} & : & \frac{7}{5} \\ & = 25 & : & 21 \end{array}$$

Diff

4 unit = 4500

1 unit = 1125

×1125

$\boxed{23625}$

$\therefore$ Income of B $= \frac{15}{7} \times 23625 = 50625$

Note:- We need not find answer by multiplying since, we have the factor of 3 in it.
So, we can just find the option which is the multiple of '3'.
Here option (d), 50625 is the multiple of '3'.

133. (b) A's income $= \frac{2}{3}$ of B's income

$\frac{1}{3}$ of B's income = exp. of A

$\Rightarrow \frac{\text{Expenditure of A}}{\text{Income of B}} = \frac{1}{3}$

$$\begin{array}{lccc} & A & : & B \\ \text{Inc} & = 2_{\times 3} & : & 3_{\times 3} \\ \text{Exp} & = 3 & : & 4 \\ \hline \text{Inc} & = 6 & : & 9 \\ \text{Exp} & = 3 & : & 4 \\ \hline \text{Sav} & = 3 & : & 5 \end{array}$$

134. (a)

$$\begin{array}{rccc} & A & : & B \\ 2020 \rightarrow & 5 & : & 4 \\ 2021 \rightarrow & \frac{5}{4} \times 5 & : & \frac{3}{2} \times 4 \\ & = \frac{25}{4} & : & 6 \\ & = 25 & : & 24 \end{array}$$

sum

49 unit = 705600

1 unit = 14400

×14400

$\boxed{345600}$

∴ B's salary in 2021 = ₹3,45,600

135. (d) Taking LCM of 4, 3, 5 = 60

$$\begin{array}{rcccccccc} & A & : & B & & A & : & B \\ \text{Last year} \rightarrow & 4 & : & 3 & \Rightarrow & 60 & : & 45 \end{array}$$

$$\begin{array}{rcccccccc} & \text{Last} & : & \text{Present} & & & & \\ A \rightarrow & 3 & : & 4 & \Rightarrow & 60 & : & 80 \\ B \rightarrow & 5 & : & 6 & \Rightarrow & 45 & : & 54 \end{array}$$

$(80 + 54)x = 24.12$

$\Rightarrow 134x = 24.12 \quad \Rightarrow x = 0.18$ lakh

Sum of income of A in last year and B in present year $= 60x + 54x = 114x$
$= 114 \times 0.18 = 20.52$ lakh

Alternate Method:

$$\begin{array}{rccc} & A & : & B \\ \text{Last year} \rightarrow & 4x & : & 3x \\ \text{Present year} \rightarrow & 4x \times \frac{4}{3} & : & 3x \times \frac{6}{5} \end{array}$$

$\frac{16x}{3} + \frac{18x}{5} = 24.12$ lakh

$\Rightarrow \frac{134x}{15} = 24.12$ lakh $\Rightarrow x = 2.7$ lakh

Sum of income of A in last year and B in present year

$= 4x + \frac{18x}{5} = \frac{38x}{5} = \frac{38 \times 2.7}{5}$

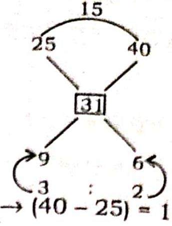
= 20.52 lakh

136. (c) We know that,

Compound ratio $= \frac{3}{4} \times \frac{6}{7}$

$\Rightarrow \frac{36}{X} = \frac{3 \times 6}{4 \times 7} \Rightarrow X = 56$

137. (c)



(3 + 2) unit → (40 – 25) = 15
5 unit → 15
1 unit → 3
So, cost price mixture = 31 per kg

Alternate Method:

Cost price of the mixture per kg

$= \frac{25 \times 3 + 40 \times 2}{(3+2)} = 31$

138. (b) Let price of third variety rice = x
Avg. price of variety

$\Rightarrow 612 = \frac{1 \times 504 + 1 \times 540 + 2 \times x}{4}$

$\Rightarrow 612 = \frac{504 + 540 + 2x}{4}$

$\Rightarrow 2448 = 1044 + 2x$

$\Rightarrow 2x = 2448 - 1044$

$\Rightarrow 2x = 1404 \Rightarrow x = 702$

∴ Price of third variety rice = ₹702

Alternate Method:

$$\begin{array}{rccccc} \text{Ratio} \rightarrow & 1 & : & 1 & : & 2 \\ \text{Price} \rightarrow & 504 & : & 540 & : & x \end{array}$$

Avg. → 612

$x = 612 + \frac{(612 - 504) + (612 - 540)}{2}$

$\Rightarrow x = 612 + \frac{108 + 72}{2}$

$\Rightarrow x = 612 + 90 = 702$

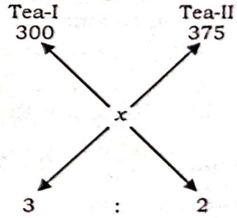
139. (d)

$$\begin{array}{rccccc} & I & & II & & III \\ \text{Quantity} \rightarrow & 1 & : & 2 & : & 3 = 6 \\ \text{Rate} \rightarrow & 80 & & 50 & & x = 75 \\ \hline \text{Ex.} \rightarrow & 80 & & 100 & & 3x = 450 \end{array}$$

$180 + 3x = 450$

$\Rightarrow 3x = 450 - 180 \Rightarrow x = 90$

140. (b) Let the mixed price of the tea is ₹x.



Now,

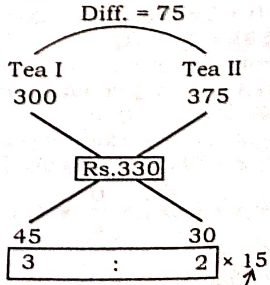
$\Rightarrow \frac{375 - x}{x - 300} = \frac{3}{2} \Rightarrow 750 - 2x$

$= 3x - 900$

$\Rightarrow 750 + 900 = 3x + 2x$

$\Rightarrow 1650 = 5x \Rightarrow x = 330$

Alternate Method:



5 unit → 75
1 unit → 15

SMART APPROACH:-

Mixed price = $\frac{3\times300+2\times375}{3+2}$

$= \frac{900+750}{5} = \frac{1650}{5}$ = Rs.330

141. (b)

		Coffee		Tea
Price	→	3	:	4
Consumption	→	4	:	7
Exp	→	3 × 4	:	4 × 7
	=	3	:	7

142. (c)

	Ram	Ramesh	Naresh
Mistaken =	3	4	6
Actual =	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{6}$
⇒	4	3	2

Hence, Naresh gained the most.
His Actual portion

$= \frac{2}{9} \times 702 = 156$

Mistaken portion = $\frac{6}{13} \times 702 = 324$

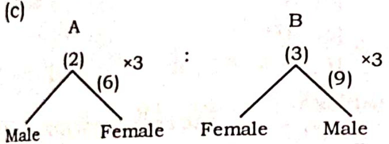
∴ Profit = 324 – 156 = 168

Alternate Method:

When we found that Naresh gained the most portion

We don't need to solve question further. Naresh is only given in option (c)

143. (c)



Male = 4 : 5

Alternate Method:

	A	:	B
Total →	2x	:	3x
Female →	y	:	2y

ATQ,

$\frac{y}{2x} = \frac{1}{3} \Rightarrow \frac{y}{x} = \frac{2}{3}$

	A	:	B
Total →	6	:	9
Female →	2	:	4
∴ Males →	4	:	5

144. (d) Men in blue dress : Women in red dress = $3x : 7x$

Men in red dress : Women in blue dress = 2y : y

ATQ,

$\frac{3x+y}{7x+2y} = \frac{35}{76}$

$\Rightarrow 228x + 76y = 245x + 70y$

$\Rightarrow 6y = 17x$

$\Rightarrow \frac{x}{y} = \frac{6}{17}$

Number of men = $3x + 2y$

= 3 × 6 + 2 × 17 = 52

Number of women = $7x + y$

= 7 × 6 + 17 = 59

∴ Required ratio = 52 : 59

145. (b)

	Yellow marbles	:	Blue marbles
Quantity →	y	:	b

ATQ,

$\frac{18}{100}y + \frac{24}{100}b = 30$

$\Rightarrow 18y + 24b = 3000$ ......(i)

$3y = 2b + 200$ .....(ii)

From eqn. (i) and (ii)

$3000 - 24b = 12b + 1200$

$\Rightarrow 36b = 1800$

$\Rightarrow b = 50$

$3y = 2 \times 50 + 200$

$\Rightarrow y = 100$

$\therefore y^2 : b^2 = 100^2 : 50^2 = 4 : 1$

146. (d)

A	:	D	:	N	:	K	
2	:	3	:	1			= 6 ×2
		5	:	4	:	3	= 12
4	:	6	:	2			
		5	:	4	:	3	
4	:	11	:	6	:	3	

Weight of Kangra valley tea per kilogram = $\frac{3}{4+11+6+3} \times 1000$ gm

$= \frac{3}{24} \times 1000 = 125$ gm.

147. (b) Mark obtained → 3 : 5 : 6

Maximum mark → 7 : 11 : 10

ATQ,

∴ Marks obtained in

$A \rightarrow \frac{3}{7} < 50\%$

$B \rightarrow \frac{5}{11} < 50\%$

$B \rightarrow \frac{6}{10} > 50\%$

∴ Only in one subject he scored more than 50%

148. (d)

	Plastic	:	Wood	:	Glass
No. →	2	:	3	:	5

$\underbrace{3 : 5}_{\text{Diff.}}$

2 unit = 144

$25\% = \frac{1}{4} \xrightarrow{+} \frac{5}{4}$

Now no. of plastic boxes

$= \frac{5}{4} \times 144 = 180$

149. (b) Cost of Diamond ∝ (weight)^2

Weight → 3 : 2 : 1

Cost → 9 : 4 : 1 = 14

Original cost of diamond = 6^2 = 36 unit

Loss = 36 – 14 = 22 unit

36 unit → 6084

1 unit → 169

∴ 22 unit → 22 × 169 = ₹3718

150. (b) Given, price ∝ wight^2

Weight → 2 : 3

Cost → 4 : 9 = 13

Original cost = 5^2 = 25 unit

25 unit = 1,20,000

13 unit = 62,400

151. (a) Given, Price ∝ weight^2

⇒ 230400 = k × 48 × 48

⇒ k = 100

Ratio of weight = $\begin{array}{ccccc} 5 & : & 7 & = & 12 \\ \downarrow\times4 & & \downarrow\times4 & & \downarrow\times4 \\ 20g & & 28g & & 48g \end{array}$

Price of 20 gm. = 20 × 20 × 100 = 40000

Price of 28 gm = 28 × 28 × 100 = 78400

∴ Loss incurred = 230400 – 118400

= ₹112000

152. (d) Price ∝ (weight)^2

Unbroken diamond cost

= $(14)^2$ = 196

Weight → 5 : 9

Cost → 25 : 81 = 106

∴ Loss % = $\frac{196-106}{196} \times 100$

$= \frac{90}{196} \times 100 = 45.92\%$

153. (c) Cost ∝ (weight)^2

Cost of one piece = K × $(10)^2$

= 100 K

Cost of broken pieces

= (16 + 9 + 4 + 1)K = 30 K

ATQ,

100K – 30K = 63000

⇒ K = 900

∴ Cost of original piece = 900 × 100

= 90,000

SPEED BOOSTER HACKS

◆ Squares from 1 to 50, you should remember ◆

$(1)^2 = 1$	$(6)^2 = 36$	$(11)^2 = 121$	$(16)^2 = 256$	$(21)^2 = 441$	$(26)^2 = 676$	$(31)^2 = 961$	$(36)^2 = 1296$	$(41)^2 = 1681$	$(46)^2 = 2116$
$(2)^2 = 4$	$(7)^2 = 49$	$(12)^2 = 144$	$(17)^2 = 289$	$(22)^2 = 484$	$(27)^2 = 729$	$(32)^2 = 1024$	$(37)^2 = 1369$	$(42)^2 = 1764$	$(47)^2 = 2209$
$(3)^2 = 9$	$(8)^2 = 64$	$(13)^2 = 169$	$(18)^2 = 324$	$(23)^2 = 529$	$(28)^2 = 784$	$(33)^2 = 1089$	$(38)^2 = 1444$	$(43)^2 = 1849$	$(48)^2 = 2304$
$(4)^2 = 16$	$(9)^2 = 81$	$(14)^2 = 196$	$(19)^2 = 361$	$(24)^2 = 576$	$(29)^2 = 841$	$(34)^2 = 1156$	$(39)^2 = 1521$	$(44)^2 = 1936$	$(49)^2 = 2401$
$(5)^2 = 25$	$(10)^2 = 100$	$(15)^2 = 225$	$(20)^2 = 400$	$(25)^2 = 625$	$(30)^2 = 900$	$(35)^2 = 1225$	$(40)^2 = 1600$	$(45)^2 = 2025$	$(50)^2 = 2500$

07 Chapter

PROPORTION

• TYPE – I •
WHEN THREE NUMBERS ARE GIVEN

1. The first proportional of three numbers 6, 12 and 24 is :
(a) 3 (b) 4
(c) 7 (d) 6

2. The second proportional of three numbers 28, 4 and 5 is :
(a) 39 (b) 48
(c) 35 (d) 40

3. The third proportional of three numbers 2, 3 and 15 is :
(a) 10 (b) 20
(c) 30 (d) 40

4. Find the third proportional of 9, 7, ?, 14.
SSC Phase XII 26/06/2024 (Shift-02)
(a) 18 (b) 16
(c) 24 (d) 21

5. The fourth proportional to the numbers 5, 6 and 8 is:
SSC CHSL 24/05/2022 (Shift-03)
(a) 9.8 (b) 9.6
(c) 9 (d) 9.5

6. Find the fourth proportional to 4, 9 and 16.
SSC CGL 23/09/2024 (Shift-02)
(a) 18 (b) 27
(c) 36 (d) 16

7. Find the fourth proportional to 2, 6, 8.
SSC CHSL 04/07/2024 (Shift-02)
(a) 36 (b) 48
(c) 12 (d) 24

8. Find the fourth proportion to 10, 12, and 15.
SSC CPO 27/06/2024 (Shift-02)
(a) 16 (b) 20
(c) 18 (d) 22

9. The fourth proportional of 64, 80 and 88 is:
SSC Phase XII 25/06/2024 (Shift-03)
(a) 110 (b) 100
(c) 120 (d) 90

10. Find the fourth proportional to 18, 36 and 52.
SSC CHSL 27/05/2022 (Shift-03)
(a) 48 (b) 104
(c) 127 (d) 81

11. If 42, 36 and 35 are the first three terms of a proportion, then the fourth term is:
SSC CPO 03/10/2023 (Shift-01)
(a) 30 (b) 32
(c) 28 (d) 27

12. The fourth proportion to 12, 24 and 27 is the same as the third proportion to A and 36. What is the value of A?
SSC CGL 05/12/2022 (Shift-03)
(a) 22 (b) 24
(c) 26 (d) 20

13. If the four numbers, 39, 117, 17 and y are in proportion, then find the value of y.
SSC CGL 14/07/2023 (Shift-01)
(a) 49 (b) 51
(c) 57 (d) 85

14. If X, Y, Z and W are in fourth proportion. X = 3, Y = 13 and W = 39, then the vlaue of Z.
SSC CPO 10/11/2022 (Shift-02)
(a) 5 (b) 20
(c) 15 (d) 9

15. Find the ratio between the fourth proportional of 42, 56, 63 and the fourth proportional of 189, 273, and 153.
SSC Phase XII 21/06/2024 (Shift-03)
(a) 33 : 84 (b) 217 : 42
(c) 33 : 221 (d) 84 : 221

16. The fourth proportional to 4, a and 16a is 81. What is the value of a?
SSC CPO 27/06/2024 (Shift-01)
(a) $\frac{13}{2}$ (b) $\frac{9}{2}$
(c) $\frac{11}{2}$ (d) $\frac{5}{2}$

17. The fourth proportion of 2a & 5a is __.
SSC MTS 11/09/2023 (Shift-01)
(a) $\frac{5a^2}{2}$ (b) $\frac{2a^2}{3}$
(c) $\frac{2a^2}{5}$ (d) $\frac{5a^2}{3}$

18. Find the fourth proportion to 1.25, 5.75 and 3.5.
SSC CHSL 05/07/2024 (Shift-04)
(a) 16.1 (b) 12.5
(c) 6.5 (d) 4.5

19. The fourth proportional to 0.3, 0.8 and 0.108 is:
SSC CPO 04/10/2023 (Shift-02)
(a) 0.482 (b) 0.124
(c) 0.144 (d) 0.288

20. What is the fourth proportional of $\frac{1}{72}, \frac{1}{168}, \frac{1}{150}$?
SSC Phase-X 02/08/2022 (Shift-02)
(a) $\frac{1}{250}$ (b) $\frac{1}{275}$
(c) $\frac{1}{375}$ (d) $\frac{1}{350}$

21. Find the fourth proportion of the following numbers: $\frac{1}{3}$ rd of 27, $\frac{4}{5}$ th of 30, $\frac{3}{7}$ th of 35.
SSC Phase XII 24/06/2024 (Shift-0
(a) 45 (b) 38
(c) 40 (d) 35

22. Find the fourth proportional of the numbers $\frac{1}{3}$ rd of 15, $\frac{4}{5}$ th of 25, $\frac{3}{7}$ th of 35:
SSC CHSL 09/08/2023 (Shift-01)
(a) 65 (b) 55
(c) 60 (d) 50

23. Find the fourth proportional of 12^{35}, 3^{12} and 4^{12}.
SSC MTS 14/09/2023 (Shift-0
(a) 3^{24} (b) 12^{-23}
(c) 4^{24} (d) 12^{-11}

24. If $2^3 : 8^{5.06} :: 8^{-4.06} : x$, find the value of x.
SSC CHSL 01/07/2024 (Shift-0
(a) $\frac{1}{2^3}$ (b) 1
(c) 2^3 (d) 0

25. What is the fourth proportional of $3\sqrt{5}$, $5\sqrt{8}$ and $3\sqrt{10}$
SSC CHSL 09/08/2023 (Shift-04)
(a) $10\sqrt{5}$ (b) $40\sqrt{2}$
(c) 30 (d) 20

26. Find the fourth proportional of $(a + b)^2 \times (a^3 - b^3)$, $(a^3 + b^3)$, $(a^2 - b^2)$.
SSC MTS 01/09/2023 (Shift-02)
(a) $\frac{(a^2 - ab + b^2)}{(a + b)}$ (b) $\frac{(a^2 - ab + b^2)}{(a^2 + ab + b^2)}$
(c) $\frac{(a^2 + ab + b^2)}{(a - b)}$ (d) $\frac{(a^2 + ab + b^2)}{(a^2 - b^2)}$

27. Find the fourth proportional of $(x^4 - y^4)$, $(x + y)$ and $(x - y)$, provided $x \neq y$.
SSC Phase-XI 30/06/2023 (Shift-01)
(a) $(x^2 - y^2)^{-1}$ (b) $(x^2 + y^2)^{-2}$
(c) $(x^2 - y^2)^{-2}$ (d) $(x^2 + y^2)^{-1}$

• TYPE – II •
WHEN TWO NUMBERS ARE GIVEN

28. Find the mean proportion of 3 & 27.
SSC CHSL 24/05/2022 (Shift-02)
(a) 5 (b) 10
(c) 6 (d) 9

29. The mean proportional of 2 & 32 is ...

SSC CGL 12/09/2024 (Shift-03)

(a) 16 (b) 8
(c) 12 (d) 6

30. Find the mean proportional of 36 and 100.

SSC CGL 18/09/2024 (Shift-01)

(a) 65 (b) 60
(c) 55 (d) 70

31. Find the mean proportional between 25 and 81.

SSC CHSL 08/07/2024 (Shift-03)

(a) 45 (b) 81
(c) 12 (d) 36

32. Find the natural number obtained when the number 13 is subtracted from the mean proportional of 75 and 12.

SSC CPO 28/06/2024 (Shift-01)

(a) 14 (b) 30
(c) 27 (d) 17

33. Find the mean proportional of 12.96 & 0.16.

SSC CGL 13/09/2024 (Shift-03)

(a) 21 (b) 96
(c) 1.44 (d) 69

34. Find the mean proportion to 0.72 and 2.85 (round up to one decimal place).

SSC CHSL 11/07/2024 (Shift-03)

(a) 0.4 (b) 2.8
(c) 0.7 (d) 1.4

35. The mean proportion of 0.14 and 2.24 is:

SSC CHSL 05/07/2024 (Shift-03)

(a) 0.56 (b) 1.02
(c) –2.39 (d) 1.12

36. The mean proportional between 0.03 and 0.0003 is:

SSC CPO 05/10/2023 (Shift-01)

(a) 0.0013 (b) 0.003
(c) 0.0003 (d) 0.033

37. What is the ratio of the mean proportion of 1.21 and 0.09 with the mean proportion of 0.16 and 0.36?

SSC CGL 11/09/2024 (Shift-03)

(a) 11 : 8 (b) 13 : 8
(c) 13 : 12 (d) 11 : 13

38. 30 is the mean proportional of 18 and A. Find the value of A.

SSC CGL 23/09/2024 (Shift-01)

(a) 60 (b) 40
(c) 45 (d) 50

39. If 35 is the mean proportional of 25 and x, then what is value of x?

SSC CHSL 02/07/2024 (Shift-02)

(a) 46 (b) 47
(c) 49 (d) 48

40. The mean proportion between 17 and some unknown number is 51. What is the unknown number?

SSC MTS 12/09/2023 (Shift-03)

(a) 17 (b) 153
(c) 51 (d) 151

41. If x is the mean proportional between 12.8 and 64.8, then the value of x is:

SSC CGL 06/12/2022 (Shift-02)

(a) 32 (b) 34
(c) 28.8 (d) 26.4

42. What is the ratio of the mean proportional between 1.2 and 10.8 to the third proportional to 0.2 & 1.2?

SSC CHSL 10/08/2021 (Shift-03)

(a) 3 : 1 (b) 2 : 1
(c) 1 : 3 (d) 1 : 2

43. If the mean proportional between p and q is 12, then the possible values of p and q respectively, are:

SSC CGL 24/09/2024 (Shift-02)

(a) 3, 38 (b) 3, 28
(c) 24, 6 (d) 24,16

44. If 28.9 : x :: x : 36.1, and $x > 0$, then find the value of x.

SSC CGL 12/09/2024 (Shift-01)

(a) 38.3 (b) 32.3
(c) 30.4 (d) 35

45. If 405 : y :: y : 125, and y > 0, then find the value of y.

SSC CGL 18/07/2023 (Shift-02)

(a) 225 (b) 205
(c) 215 (d) 235

46. Let M denote the mean proportional between 16 and 9 and let N denote the third proportional of 9 and 15. Find the value of 5M + 3N.

SSC Phase-XI 28/06/2023 (Shift-03)

(a) 300 (b) 125
(c) 135 (d) 225

47. If the mean proportional between 5 and 125 is x and the mean proportional between 4^4 and 6^2 is y, find the value of $2x$: y.

SSC Phase-X 04/08/2022 (Shift-02)

(a) 25 : 96 (b) 25 : 48
(c) 25 : 128 (d) 25 : 64

48. If a : b :: b : c, and b = 96 then which of the following can be a possible pair of values of a and c?

SSC CGL 20/07/2023 (Shift-02)

(a) a = 24, c = 374
(b) a = 32, c = 288
(c) a = 48, c = 168
(d) a = 16, c = 586

49. Find the mean proportion between $(6 + \sqrt{8})$ and $(3 - \sqrt{2})$.

SSC CGL 03/12/2022 (Shift-02)

(a) $2\sqrt{12}$ (b) $\sqrt{14}$
(c) $(6 - \sqrt{8})$ (d) $\sqrt{15} - 7$

50. The mean proportional between $\left(3+\sqrt{5}\right)$ and $\left(15-\sqrt{125}\right)$ is ____.

SSC Phase-XI 27/06/2023 (Shift-02)

(a) $3\sqrt{5}$ (b) $5\sqrt{2}$
(c) $9\sqrt{5}$ (d) $2\sqrt{5}$

51. The mean proportional of a and b is c. What is the mean proportion of a^2 c and b^2 c?

SSC CGL 06/12/2022 (Shift-01)

(a) c (b) 3c
(c) c^3 (d) c^2

52. Find the mean proportion of x^3y and xy^3.

SSC CPO 04/10/2023 (Shift-03)

(a) xy (b) $x^2 y^2$
(c) x^3y^3 (d) x^4y^4

53. What is the mean proportional of $45x^4$ and $5y^2$?

SSC Phase XII 21/06/2024 (Shift-02)

(a) $5x^2y$ (b) $15x^2y$
(c) $25x^4y$ (d) $45x^2y^2$

54. The mean proportion of a and $\frac{a}{b^2}$ is ....

SSC MTS 05/09/2023 (Shift-02)

(a) ab (b) $\frac{b}{a}$
(c) $\frac{a}{2b}$ (d) $\frac{a}{b}$

55. Let a be a positive number and $b = \frac{4}{a}$. What is the mean proportional of a and b?

SSC CPO 28/06/2024 (Shift-03)

(a) 4 (b) 3
(c) 2 (d) a

56. The mean proportional of $8a^2$ and $\frac{18}{a^4}$, where a is a positive number, is ______.

SSC CGL 09/09/2024 (Shift-03)

(a) $\frac{12}{a^2}$ (b) 12a
(c) $12a^2$ (d) $\frac{12}{a}$

57. The mean proportional of $4a^2$ and x is $\frac{1}{5a}$, where a is a positive number, then the value of x is________.

SSC CGL 18/09/2024 (Shift-02)

(a) $\frac{1}{100a^4}$ (b) $\frac{1}{100a^2}$
(c) $\frac{1}{25a^2}$ (d) $\frac{1}{25a^4}$

58. The mean proportional of $(a + b)(a - b)^3$, $(a + b)^3(a - b)$ is;

SSC CGL 25/07/2023 (Shift-04)

(a) $(a + b)^2 (a - b)$ (b) $(a + b)^2 (a - b)^2$
(c) $(a + b) (a - b)^2$ (d) $a^2 - b^2$

59. Find the mean proportion between $\frac{p-q}{p+q}$ and $\frac{(pq)^2}{p^2-q^2}$.

SSC Phase-XI 30/06/2023 (Shift-04)

(a) $\frac{pq}{p-q}$ (b) $\frac{p-q}{pq}$
(c) $\frac{pq}{p+q}$ (d) $\frac{p+q}{pq}$

60. Find the mean proportion of $\frac{a^3+b^3}{a-b}$ and $\frac{a^2-b^2}{a^2-ab+b^2}$

SSC CGL 06/12/2022 (Shift:03)

(a) 1 (b) a + b
(c) $\frac{a+b}{a-b}$ (d) $\sqrt{a+b}$

61. Find the third proportion to 36 & 48.

SSC CHSL 04/07/2024 (Shift-03)

(a) 54 (b) 36
(c) 48 (d) 64

62. If P is the third proportional of 3, 9, then what is the fourth proportional to 6, P, 4?

SSC CGL Tier-I 24/08/2021

(a) $\frac{3}{2}$ (b) $2\sqrt{3}$
(c) 10 (d) 18

63. If the third proportion of 3 and x is 27 and the third proportion of 2 and y is 8, then find $x : y$.

SSC MTS 03/05/2023 (Shift-02)

(a) 7 : 9 (b) 4 : 5
(c) 3 : 7 (d) 9 : 4

64. If p is the third proportional to 8, 20 and q is the fourth proportional to 3, 5, 24 , then find the value of (2p + q).

SSC CGL 11/04/2022 (Shift-03)

(a) 140 (b) 126
(c) 90 (d) 104

65. The third proportional to $(5^2 - 3^2)$ and $(5 - 3)$ is:

SSC Phase XII 25/06/2024 (Shift-03)

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$
(c) $\frac{1}{2}$ (d) $\frac{1}{8}$

66. The third proportional to $(x^2 - y^2)$ and $(x - y)$ is:

SSC CGL 18/07/2023 (Shift-01)

(a) $(x - y)$ (b) $\frac{x-y}{x+y}$
(c) $\frac{x+y}{x-y}$ (d) $(x + y)$

67. If a : b = c : d, then which of the following ratio is equal to a : c?

SSC CGL 03/12/2022 (Shift-01)

(a) a : d (b) b : c
(c) a + d : b + c (d) a + b : c + d

◆ TYPE – III ◆
PROPORTION AFTER ADDITION/SUBTRACTION

68. Which number should be added to 3, 11, 4 and 14 to make them in proportion?

SSC Phase XII 25/06/2024 (Shift-02)

(a) 2 (b) 1
(c) 3 (d) 4

69. When x is added to each of the numbers 7, 11, 18 and 23, then the number so obtained are in proportion. What is the mean proportional between the $(x - 1)$ and $(2x - 10)$?

SSC CHSL 03/07/2024 (Shift-04)

(a) 68 (b) 78
(c) 98 (d) 48

70. When x is added to each of 2, 3, 30 and 35, then the numbers obtained in this order, are in proportion. What is the mean proportional between $(x + 7)$ & $(x - 2)$?

SSC CGL, TIER-II 11/09/2019

(a) 7 (b) 4
(c) 6 (d) 5

71. If x is subtracted from each of 24, 40, 33 and 57, the numbers, so obtained are in proportion. The ratio of $(5x + 12)$ to $(4x + 15)$ is

SSC CGL 23/08/2021 (Shift-02)

(a) 4 : 3 (b) 14 : 13
(c) 7 : 4 (d) 7 : 5

72. When x is subtracted from each of 24, 33, 20 and 26, the number so obtained in this order are in proportion. What is the mean proportional between $(2x + 1)$ and $(5x - 11)$?

SSC MTS 27/10/2021 (Shift-02)

(a) 30 (b) 35
(c) 20 (d) 428

◆ TYPE – IV ◆
MISCELLANEOUS QUESTIONS

73. If four distinct positive numbers, a, b, c and d in the order given are in proportion then which of the following options is NOT correct?

SSC CPO 28/06/2024 (Shift-02)

(a) b, a, d and c, in the order given are in proportion
(b) c, d, b and a, in the order given are in proportion.
(c) d, c, b and a, in the order given are in proportion.
(d) a, c, b and d, in the order given are in proportion.

74. Four distinct positive numbers, 'a', 'b', 'c' and 'd', in the order given, are in proportion. 'b' is 35 more than 'a' and 'd' is 60 more than 'c'. The product of 'a' and 'c' is 5376. What is the sum of 'a', 'b', 'c' and 'd'?

SSC Phase XII 26/06/2024 (Shift-03)

(a) 400 (b) 398
(c) 397 (d) 399

75. If x varies inversely as y and $x = 2$ when y = 6, then the value of y when $x = 3$ is:

SSC CGL 09/09/2024 (Shift-02)

(a) 2 (b) 3
(c) 4 (d) 6

76. If $a \propto b$, $b \propto \frac{1}{c}$ and $c \propto d$, then the relation between a and d is:

SSC CPO 03/10/2023 (Shift-02)

(a) $a \propto \sqrt{d}$ (b) $a \propto d$
(c) $a \propto \frac{1}{d}$ (d) $a \propto d^2$

77. M is inversely proportional to N. If M is 20, then N is 70. If N = 50, then what is the value of M?

SSC MTS 07/07/2022 (Shift-01)

(a) 20 (b) 700
(c) 28 (d) 600

78. A varies directly as (B + 18) and A = 108 when B = 36 Find the value of A when B = 68

SSC CGL 19/07/2023 (Shift-01)

(a) 75 (b) 86
(c) 127 (d) 172

79. A varies directly with B. When A = 52, B = 91. Find the value of A when B = 126.

SSC Phase-XI 27/06/2023 (Shift-03)

(a) 76 (b) 84
(c) 72 (d) 70

80. M varies inversely as $(N^2 + 3)$. If M = 3 when N = 3, then what will be the value of M when $N^2 = 69$?

SSC CHSL 01/07/2024 (Shift-04)

(a) $\frac{1}{2}$ (b) 1
(c) $\sqrt{69}$ (d) $\frac{1}{4}$

81. A varies directly as the positive square root of B, and inversely as the cube of C. If A = 15, when B = 27 and C = 2, then find B when A = 9 and C = 2.

SSC CGL 05/12/2022 (Shift-02)

(a) $\frac{281}{42}$ (b) $\frac{243}{25}$
(c) $\frac{264}{37}$ (d) $\frac{275}{51}$

82. A's marks in Mathematics are directly proportional to practice time. In 6 hours of practice, A gets 70 marks. What should be the practice time (approximately) to get 90 marks?

SSC CHSL 08/07/2024 (Shift-01)

(a) 8 hours (b) 8.3 hours
(c) 7 hours (d) 7.7 hours

83. A function of two variable varies directly with x and inversely with y. Determine function when $x = 5$ and y = 3. Given that, for $x = 0$ and y = 1, f = 15 and for $x = 1$ and y = 15, f = 2.

SSC CGL 17/09/2024 (Shift-03)

(a) 10 (b) 2
(c) 5 (d) 15

84. 'x' varies directly with the cube of 'y', and inversely with the square of 'z'. If $x = \frac{1}{36}$ when y = 2 and z = 3, then what is the value of $800x$ when y = 3 and z = 5?

SSC CGL 25/09/2024 (Shift-03)

(a) $\frac{9}{800}$ (b) 27
(c) $\frac{800}{9}$ (d) 9

85. y is directly proportional to $x + 3$ and y = 8 when $x = 1$, x inversely proportional to z and $x = 2$ when z = 6 Find the relation between y and z.

MTS 12/09/2023 (Shift-02)

(a) $\frac{(y-6)}{z-24}$ (b) $z(y - 6) = 24$
(c) $\frac{(y-6)}{z-12}$ (d) $z(y - 6) = 12$

86. The age of a tree depends on the number of rings in the trunk. The value of a such tree is proportional to its age. If a tree with 40 rings and 50 years of age has a value of ₹50,000, then a tree with 30 rings is its value is _____ yeas of age and its value is ₹ _____.

SSC CHSL 09/07/2024 (Shift-02)

(a) 37.5,57500
(b) 37.5, 37500
(c) 57.5,57500
(d) 57.5,37500

87. The falling height of an object is directly proportional to the square of the time. An object falls 80 cm in 4 seconds. Then in 8 seconds, from how much height (in cm) will the object fall?

SSC MTS 12/09/2023 (Shift-01)

(a) 420
(b) 320
(c) 480
(d) 360

88. What smallest positive number should be subtracted from 2 and 3 so that 4 is the third proportion to them?

SSC CGL 26/07/2023 (Shift-04)

(a) 1 (b) 2
(c) 4 (d) 3

89. The weight of a circular disc varies directly as the product of the square of the radius and its thickness. Two identical/similar discs have their thickness in the ratio of 16 : 9. What is the ratio of their radii if the weight of the first is four times that of the second?

SSC MTS 12/09/2023 (Shift-03)

(a) 1 : 2
(b) 2 : 3
(c) 3 : 2
(d) 2 : 1

90. The weight of a cube varies directly as the product of its volume and its density. The ratio of densities of the materials of the first cube and second cube is 27 : 16. If the weight of the first cube is 4 times the weight of the second cube, then what is the ratio of the edges of the first cube and second cube?

SSC MTS 14/09/2023 (Shift-02)

(a) 3 : 2
(b) 2 : 3
(c) 3 : 4
(d) 4 : 3

ANSWER KEY

1.	(a)	2.	(c)	3.	(a)	4.	(a)	5.	(b)	6.	(c)	7.	(d)	8.	(c)	9.	(a)	10.	(b)
11.	(a)	12.	(b)	13.	(b)	14.	(d)	15.	(d)	16.	(b)	17.	(a)	18.	(a)	19.	(d)	20.	(d)
21.	(c)	22.	(c)	23.	(b)	24.	(b)	25.	(d)	26.	(b)	27.	(d)	28.	(d)	29.	(b)	30.	(b)
31.	(a)	32.	(d)	33.	(c)	34.	(d)	35.	(a)	36.	(b)	37.	(a)	38.	(d)	39.	(c)	40.	(b)
41.	(c)	42.	(d)	43.	(c)	44.	(b)	45.	(a)	46.	(c)	47.	(b)	48.	(b)	49.	(b)	50.	(d)
51.	(c)	52.	(b)	53.	(b)	54.	(d)	55.	(c)	56.	(d)	57.	(a)	58.	(b)	59.	(c)	60.	(b)
61.	(d)	62.	(d)	63.	(d)	64.	(a)	65.	(b)	66.	(b)	67.	(d)	68.	(b)	69.	(d)	70.	(c)
71.	(b)	72.	(b)	73.	(b)	74.	(d)	75.	(c)	76.	(c)	77.	(c)	78.	(d)	79.	(c)	80.	(a)
81.	(b)	82.	(d)	83.	(a)	84.	(b)	85.	(b)	86.	(b)	87.	(b)	88.	(a)	89.	(c)	90.	(d)

SOLUTIONS

1. (a) $x : 6 :: 12 : 24$

$$\frac{x}{6} = \frac{12}{24}$$

$x = 3$

2. (c) $28 : x :: 4 : 5$

$$\frac{28}{x} = \frac{4}{5}$$

$x = 35$

3. (a)

$$\overset{\times 5}{\underset{\times 5}{\frac{2}{3} = \frac{x \to 10}{15}}}$$

4. (a)

$$\overset{\times 2}{\underset{\times 2}{\frac{9}{7} = \frac{x \to 18}{14}}}$$

5. (b) Fourth proportional (d) = $\frac{bc}{a}$

$$= \frac{6 \times 8}{5} = \frac{48}{5} = 9.6$$

6. (c) Fourth proportion = $\frac{bc}{a} = \frac{9 \times 16}{4} = 36.$

7. (d) Fourth proportional of 2, 6, 8

$$= \frac{6 \times 8}{2} = 24$$

8. (c) Fourth proportion of 10, 12 and 15

$$\Rightarrow \frac{10}{12} = \frac{15}{x} \Rightarrow x = 18$$

9. (a) Fourth proportional (d) = $\frac{b \times c}{a}$

$$= \frac{80 \times 88}{64} = 110$$

10. (b) Fourth proportion : $\frac{A}{B} = \frac{C}{D}$

$$\Rightarrow \frac{18}{36} = \frac{52}{x} \Rightarrow x = 104$$

11. (a)

$$\begin{array}{ccccccc} 42 & : & 36 & :: & 35 & : & x \\ \downarrow & & \downarrow & & \downarrow & & \downarrow \\ a & & b & & c & & d \end{array}$$

Fourth proportion (d) = $\frac{bc}{a}$

$$= \frac{36 \times 35}{42} = 30$$

12. (b) $\frac{12}{24} = \frac{27}{a} \Rightarrow a = 27 \times 2 = 54$

and $\frac{A}{36} = \frac{36}{b} \Rightarrow b = \frac{36 \times 36}{A}$

ATQ,
a = b

$$\Rightarrow 54 = \frac{36 \times 36}{A}$$

$\Rightarrow A = 24$

Alternate Method:
ATQ,

$$\frac{27 \times 24}{12} = \frac{36 \times 36}{A} \Rightarrow A = 24$$

13. (b) ATQ,

$$\frac{39}{117} = \frac{17}{y} \Rightarrow y = \frac{17 \times 9}{3} = 51$$

14. (d) $\frac{X}{Y} = \frac{Z}{W}$

$$\Rightarrow \frac{3}{13} = \frac{Z}{39} \Rightarrow Z = 9$$

15. (d) 42, 56, 63, x

$$\therefore x = \frac{63 \times 56}{42} = 84$$

189, 273, 153, y

$$\therefore y = \frac{153 \times 273}{189} = 221$$

$\therefore x : y = 84 : 221$

16. (b) Fourth proportional of a, b, and c

$$= \frac{b \times c}{a} \Rightarrow \frac{16a \times a}{4} = 81 \Rightarrow 4a^2 = 81$$

$$\Rightarrow a^2 = \frac{81}{4} \Rightarrow a = \frac{9}{2}$$

17. (a) Let the fourth proportion is x.
ATQ,

$$\frac{2}{a} = \frac{5a}{x} \Rightarrow x = \frac{5a^2}{2}$$

18. (a) Let the fourth proportion = x

$$\Rightarrow \frac{1.25}{5.75} = \frac{3.5}{x} \Rightarrow \frac{5}{23} = \frac{7}{2x}$$

$$\Rightarrow x = \frac{23 \times 7}{10} = 16.1$$

19. (d) Let fourth proportional be x.

then, $\frac{0.3}{0.8} = \frac{0.108}{x}$

$\Rightarrow x = \frac{0.108 \times 0.8}{0.3} = 0.288$

20. (d) a : b = c : d

$\Rightarrow \frac{a}{b} = \frac{c}{d}$

$\Rightarrow \frac{1}{72} \times 168 = \frac{1}{150} \times \frac{1}{d}$

$\Rightarrow \frac{1}{d} = 350 \Rightarrow d = \frac{1}{350}$

$\therefore$ 4th proportional $= \frac{1}{350}$

21. (c) Let, $A = \frac{1}{3} \times 27 = 9$

$\Rightarrow B = \frac{4}{5} \times 30 = 24$

$\Rightarrow C = \frac{3}{7} \times 35 = 15$

$\therefore$ Fourth proportion $= \frac{24 \times 15}{9} = 40$

22. (c) $a = \frac{1}{3} \times 15 = 5$, $b = \frac{4}{5} \times 25 = 20$,

$c = \frac{3}{7} \times 35 = 15$

$\therefore$ Fourth proportion

$= \frac{bc}{a} = \frac{20 \times 15}{5} = 60$

23. (b) Let the fourth proportion is x.
ATQ,

$\frac{12^{35}}{3^{12}} = \frac{4^{12}}{x}$

$\Rightarrow x = \frac{4^{12} \times 3^{12}}{12^{35}} = \frac{(12)^{12}}{(12)^{35}} = \frac{1}{(12)^{23}}$

$\Rightarrow x = (12)^{-23}$

24. (b) $2^3 : 8^{5.06} :: 8^{-4.06} : x$

$\Rightarrow \frac{2^3}{8^{5.06}} = \frac{8^{-4.06}}{x} \Rightarrow \frac{2^3}{2^{15.18}} = \frac{2^{-12.18}}{x}$

$\Rightarrow 2^3 x = 2^{-12.18 + 15.18}$

$\Rightarrow 2^3 x = 2^3 \Rightarrow x = 1$

25. (d) Let, fourth proportion $= x$

$\Rightarrow \frac{3\sqrt{5}}{5\sqrt{8}} = \frac{3\sqrt{10}}{x} \Rightarrow x = \frac{3\sqrt{10} \times 5\sqrt{8}}{3\sqrt{5}}$

$= 20$

26. (b) Let the fourth proportion be x.

$x = \frac{(a^3 + b^3) \times (a^2 - b^2)}{(a + b)^2 \times (a^3 - b^3)}$

$= \frac{(a + b) \times (a^2 - ab + b^2)(a + b)(a - b)}{(a + b)^2 \times (a - b)(a^2 + ab + b^2)}$

$= \frac{a^2 - ab + b^2}{a^2 + ab + b^2}$

27. (d) Fourth proportional of $(x^4 - y^4)$,

$(x + y), (x - y) = \frac{bc}{a}$

$= \frac{(x + y)(x - y)}{(x^4 - y^4)} = \frac{(x^2 - y^2)}{(x^2 + y^2)(x^2 - y^2)}$

$= \frac{1}{(x^2 + y^2)} = (x^2 + y^2)^{-1}$

28. (d) Mean proportional $= \sqrt{ab}$

$= \sqrt{3 \times 27} = \sqrt{81} = 9$

29. (b) Mean proportion of a and b

$= \sqrt{ab}$

Mean proportion of 2 and 32

$= \sqrt{2 \times 32} = \sqrt{64} = 8$

30. (b) Mean proportional $= \sqrt{ab}$

$= \sqrt{36 \times 100} = 6 \times 10 = 60$

31. (a) Mean proportional b/w 25 and 81

$= \sqrt{25 \times 81} = 5 \times 9 = 45$

32. (d) Mean proportion of

75 and 12 $= \sqrt{12 \times 75} = 5 \times 6 = 30$

No. $= 30 - 13 = 17$

33. (c) Mean proportional of a and b

$= \sqrt{ab}$

Mean proportional of 12.96 and 0.16

$= \sqrt{12.96 \times 0.16} = 3.6 \times 0.4 = 1.44$

34. (d) Mean proprotion $= \sqrt{ab}$

$= \sqrt{0.72 \times 2.85} \sim 0.8 \times 1.7 = 1.36 \sim 1.4$

35. (a) Mean proportional of a and b $= \sqrt{ab}$

Mean proportional of 0.14 and 2.24

$= \sqrt{0.14 \times 2.24}$

$= \sqrt{0.2 \times 0.7 \times 0.7 \times 3.2}$

$= 0.7 \times 0.8 = 0.56$

36. (b) Let mean proportional be x

$\Rightarrow x = \sqrt{0.03 \times 0.0003}$

$= \sqrt{3 \times 3 \times \frac{1}{10^6}} = \frac{3}{10^3} = 0.003$

37. (a) Mean proportion ratio →

$\sqrt{1.21 \times 0.09} : \sqrt{0.16 \times 0.36}$

$= 33 : 24 = 11 : 8$

38. (d) Given,

Mean proportion $= \sqrt{ab}$

$\Rightarrow 30^2 = 18 \times A$

$\Rightarrow A = \frac{900}{18} = 50$

39. (c) Mean Proportional $= \sqrt{xy}$

$\Rightarrow 35 = \sqrt{25 \times x}$

$\Rightarrow 35 \times 35 = 25 \times x$

$\Rightarrow x = 49$

40. (b) Let unknown number is x.
ATQ,

Mean proportion $= \sqrt{17 \times x}$

$\Rightarrow 51 = \sqrt{17 \times x}$

$\Rightarrow 51 \times 51 = 17 \times x \Rightarrow x = 153$

41. (c) $x^2 = 12.8 \times 64.8$

$\Rightarrow x^2 = \frac{128 \times 648}{100}$

$\Rightarrow x^2 = \frac{256 \times 324}{100} \Rightarrow x = 28.8$

42. (d) Let, mean proportion be a.

$a^2 = 1.2 \times 10.8 \Rightarrow a^2 = 12.96$

$\Rightarrow a = 3.6$

and let third proportion be b.

$b = \frac{1.2 \times 1.2}{0.2} = 7.2$

$\therefore \frac{a}{b} = \frac{3.6}{7.2} = \frac{1}{2}$

43. (c) Mean proportion $= \sqrt{pq}$

$\Rightarrow 12 = \sqrt{pq} \Rightarrow 144 = pq$

$\Rightarrow 24 \times 6 = pq$

$\therefore p = 24, q = 6$

44. (b) Given,

$\frac{28.9}{x} = \frac{x}{36.1}$

$\Rightarrow x = \sqrt{28.9 \times 36.1} = \frac{17 \times 19}{10}$

$= 32.3$

45. (a) ATQ,

$\frac{405}{y} = \frac{y}{125} \Rightarrow y = \sqrt{405 \times 125} = 225$

46. (c) Given, M is mean proportional

$M = \sqrt{16 \times 9} = 12$

and N is third proportional

$N = \frac{15 \times 15}{9} = 25$

$\therefore 5M + 3N = 5 \times 12 + 3 \times 25 = 135$

47. (b) Mean proportion of 5 & 125

$x = \sqrt{5 \times 125} = 25$

$\therefore$ Mean proportion of 4^4 & 6^2

$y = \sqrt{4^4 \times 6^2} = 96$

$\therefore$ Now, $2x : y = 2 \times 25 : 96 = 25 : 48$

48. (b) ATQ,

$\frac{a}{b} = \frac{b}{c}$

$\Rightarrow a \times c = b \times b$

$\Rightarrow ac = 96 \times 96$

$\Rightarrow ac = 16 \times 2 \times 3 \times 16 \times 6$

$= 32 \times 288$

$\therefore$ Thus, a = 32 and c = 288

49. (b) $b^2 = (6 + \sqrt{8})(3 - \sqrt{2})$

$\Rightarrow b^2 = 2(3 + \sqrt{2})(3 - \sqrt{2}) = 2 \times 7 = 14$

$\Rightarrow b = \sqrt{14}$

50. (d) ATQ,

Mean proportional $= \sqrt{ab}$

$= \sqrt{(3 + \sqrt{5}) \times (15 - \sqrt{125})}$

$= \sqrt{(3 + \sqrt{5}) \times (3 - \sqrt{5}) \times 5}$

$= \sqrt{4 \times 5} = 2\sqrt{5}$

51. (c) $c^2 = ab$

Let, d be the mean proportion

$\Rightarrow d^2 = a^2c \times b^2c$

$\Rightarrow d^2 = a^2 b^2 c^2 = c^4.c^2 \Rightarrow d = c^3$

52. (b) Let the mean proportional be a

$\Rightarrow a = \sqrt{x^3y.xy^3} = x^2 \times y^2$

53. (b) Mean proportional of a & b $= \sqrt{ab}$

$= \sqrt{45x^4 \times 5y^2} = 15x^2y$

54. (d) Mean proportion $= \sqrt{a \times \frac{a}{b^2}} = \frac{a}{b}$

55. (c) Mean proportion of a and b $= \sqrt{ab}$

$b = \frac{4}{a} \Rightarrow ab = 4 \Rightarrow \sqrt{ab} = 2$

56. (d) Mean proportion $= \sqrt{ab}$

$= \sqrt{8a^2 \times \frac{18}{a^4}} = \sqrt{\frac{144}{a^2}} = \frac{12}{a}$

57. (a) Mean proportion = $\sqrt{ab}$

$\Rightarrow \frac{1}{5a} = \sqrt{4a^2 \times x}$

$\Rightarrow \frac{1}{25a^2} = 4a^2 \times x \Rightarrow x = \frac{1}{100a^4}$

58. (b) We know, Mean proportion of a and b = $\sqrt{ab}$

$\therefore$ Mean proportion

$= \sqrt{(a+b)\times(a-b)^3\times(a+b)^3\times(a-b)}$

$= (a+b)^2\,(a-b)^2$

59. (c) Mean proportion

$= \sqrt{\frac{p-q}{p+q}\times\frac{(pq)^2}{(p-q)(p+q)}} = \frac{pq}{p+q}$

60. (b) $c^2 = \frac{a^3+b^3}{a-b}\times\frac{a^2-b^2}{a^2-ab+b^2}$

$\Rightarrow c^2 = \frac{(a+b)(a^2-ab+b^2)}{(a-b)}\times\frac{(a-b)\,(a+b)}{(a^2-ab+b^2)}$

$\Rightarrow c^2 = (a+b)^2$

$\Rightarrow c = (a+b)$

61. (d) Third proportional of 36 and 48

$= \frac{48\times48}{36} = 64$

62. (d) a : b :: b : c

$P = \frac{9\times9}{3} = 27$

a : b : c : d

$\therefore$ Fourth proportion (d) = $\frac{27\times4}{6} = 18$

63. (d) Third proportional,

$\Rightarrow \frac{3}{x} = \frac{x}{27} \Rightarrow x = 9$

and, $\frac{2}{y} = \frac{y}{8} \Rightarrow y = 4$

$\therefore \frac{x}{y} = \frac{9}{4}$

64. (a) Let, third proportion of 8 & 20 is p.

then, $\frac{8}{20} = \frac{20}{p} \Rightarrow p = 50$

Fourth proportion of 3, 5 and 24 is q.

Then, $\frac{3}{5} = \frac{24}{q} \Rightarrow q = 40$

$\therefore 2p + q = 2 \times 50 + 40 = 140$

65. (b) Let third proportional = c

$\Rightarrow c = \frac{b^2}{a} = \frac{(5-3)^2}{5^2-3^2} = \frac{4}{16} \Rightarrow c = \frac{1}{4}$

66. (b) Let the third proportion be A.

ATQ,

$\Rightarrow \frac{x^2-y^2}{x-y} = \frac{x-y}{A}$

$\Rightarrow A = \frac{(x-y)(x-y)}{(x-y)(x+y)} = \frac{x-y}{x+y}$

67. (d) $\frac{a}{b} = \frac{c}{d}$ ....(i)

$\Rightarrow \frac{a}{c} = \frac{b}{d}$ ......(ii)

Add +1 in both sides in equation (i)

$\frac{a}{b}+1 = \frac{c}{d}+1 \Rightarrow \frac{a+b}{b} = \frac{c+d}{d}$

$\Rightarrow \frac{a+b}{c+d} = \frac{b}{d}$ ......(iii)

From (ii) and (iii),

$\frac{a}{c} = \frac{a+b}{c+d}$

68. (b) 3, 11, 4, 14

$x = \frac{bc-ad}{(a+d)-(b+c)}$

$= \frac{11\times4-3\times14}{(3+14)-(11+4)} = \frac{44-42}{17-15}$

$= \frac{2}{2} = 1$

Alternate Method:

$\underset{4}{\text{diff.} = 8}\left(\frac{3+x}{11+x} = \frac{4+x}{14+x}\right)\underset{5}{\text{diff.} = 10}$

$5(3+x) = 4(4+x)$

$\Rightarrow 15 + 5x = 16 + 4x$

$\Rightarrow x = 1$

69. (d) 7, 11, 18, 23

$x = \frac{bc-ad}{(a+d)-(b+c)}$

$= \frac{11\times18-23\times7}{(23+7)-(11+18)}$

$= \frac{198-161}{30-29} = 37$

Mean proportional between $(x-1)$ and $(2x-10)$

$= \sqrt{(37-1)\times(2\times37-10)}$

$= \sqrt{36\times64} = 6\times8 = 48$

Alternate Method:

diff. 4 $\left(\frac{7+x}{11+x} = \frac{18+x}{23+x}\right)$ diff. 5

$\Rightarrow 5(7+x) = 4(18+x)$

$\Rightarrow 35 + 5x = 72 + 4x$

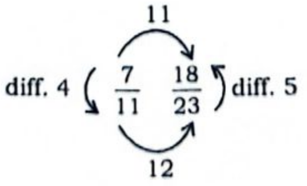
$\Rightarrow x = 37$

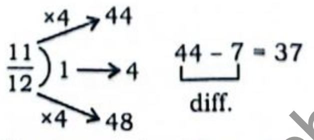
Mean proportional between $(x-1)$ and $(2x-10)$

$= \sqrt{(37-1)\times(2\times37-10)}$

$= \sqrt{36\times64} = 6\times8 = 48$

Alternate Method:





Mean proportional between $(x-1)$ and $(2x-10)$

$= \sqrt{(37-1)\times(2\times37-10)}$

$= \sqrt{36\times64} = 6\times8 = 48$

70. (c) $x = \frac{bc-ad}{(a+d)-(b+c)}$

$= \frac{3\times30-2\times35}{(2+35)-(3+30)}$

$= \frac{90-70}{37-33} = \frac{20}{4} = 5$

$\therefore$ Mean proportional of $(x+7)$ and $(x-2) = \sqrt{12\times3} = \sqrt{36} = 6$

Alternate Method:

$\frac{2+x}{3+x} = \frac{30+x}{35+x}$

By assuming value, $x = 5$

$\frac{2+5}{3+5} = \frac{30+5}{35+5} \Rightarrow \frac{7}{8} = \frac{35}{40}$

$\Rightarrow \frac{7}{8} = \frac{7}{8}$ (satisfy)

$\therefore$ Mean proportional of $(x+7)$ and $(x-2) = \sqrt{12\times3} = \sqrt{36} = 6$

Alternate Method:

Diff = 1 $\left(\frac{2+x}{3+x} = \frac{30+x}{35+x}\right)$ Diff = 5

$5(2+x) = 1\times(30+x)$

$\Rightarrow 10 + 5x = 30 + x$

$\Rightarrow 4x = 20$

$\Rightarrow x = 5$

Mean proportional of $(x+7)$ and $(x-2) = \sqrt{12\times3} = \sqrt{36} = 6$

71. (b) $\frac{24-x}{40-x} = \frac{33-x}{57-x}$

By assuming values, $x = 6$

$\frac{24-6}{40-6} = \frac{33-6}{57-6}$

$\Rightarrow \frac{18}{34} = \frac{27}{51}$

$\Rightarrow \frac{9}{17} = \frac{9}{17}$ (satisfy)

$\therefore \frac{5x+12}{4x+15} = \frac{5\times6+12}{4\times6+15} = \frac{42}{39} = \frac{14}{13}$

Alternate Method:

$\underset{=2}{\text{Diff} = 16}\left(\frac{24-x}{40-x} = \frac{33-x}{57-x}\right)\underset{=3}{\text{Diff} = 24}$

$\Rightarrow 3(24-x) = 2(33-x)$

$\Rightarrow 72 - 3x = 66 - 2x$

$\Rightarrow x = 6$

$\therefore \frac{5x+12}{4x+15} = \frac{5\times6+12}{4\times6+15} = \frac{42}{39} = \frac{14}{13}$

Alternate Method:

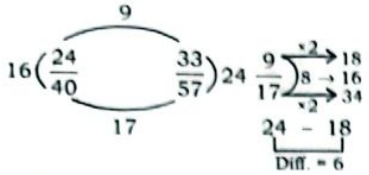
24, 40, 33, 57

$x = \frac{ad-bc}{(a+d)-(b+c)} = \frac{24\times57-40\times33}{(24+57)-(40+33)}$

$= \frac{1368-1320}{81-73} = \frac{48}{8} = 6$

$\therefore \frac{5x+12}{4x+15} = \frac{5\times6+12}{4\times6+15} = \frac{42}{39} = \frac{14}{13}$

Alternate Method:



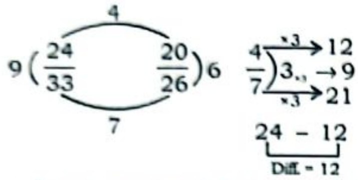
$\therefore \frac{5x+12}{4x+15}=\frac{5\times6+12}{4\times6+15}=\frac{42}{39}=\frac{14}{13}$

72. (b) Given,
No. = 24, 33, 20, 26
A.T.Q.

diff. = 9 $\left(\frac{24-x}{33-x}=\frac{20-x}{26-x}\right)$ diff. = 6
3 2

$\Rightarrow (24-x)\times 2=(20-x)\times 3$
$\Rightarrow 48-2x=60-3x \Rightarrow x=12$
So, mean proportion b/w $(2x+1)$ and $(5x-11)=\sqrt{25\times49}=5\times7=35$

Alternate Method:



$\therefore$ Mean proportion b/w $(2x+1)$ and $(5x-11)=\sqrt{(2x+1)(5x-11)}$
$=\sqrt{25\times49}=5\times7=35$

73. (b) c, d, b, a in the order given are not in proportion (false)

$\frac{a}{d}\neq\frac{b}{c}$

74. (d) $\because a+35=b,\ c+60=d$
$a\times c=5376$

$\Rightarrow \frac{a}{b}=\frac{c}{d}\Rightarrow\frac{a}{a+35}=\frac{c}{c+60}$
$\Rightarrow ac+60a=ac+35c\Rightarrow 60a=35c$
By proportion rule,
$\Rightarrow \frac{a}{c}=\frac{7x}{12x}$
$\therefore a\times c=84x^2=5376$
$\Rightarrow x=8$
$a=7\times8=56$
$b=56+35=91$
$c=12\times8=96$
$d=96+60=156$
$\therefore a+b+c+d=399$

75. (c) $x\propto\frac{1}{y}\Rightarrow x=\frac{k}{y}\Rightarrow 2=\frac{k}{6}$
$\Rightarrow k=12$
When $x=3$ then
$3=\frac{12}{y}\Rightarrow y=4$

76. (c) $a\propto b\propto\frac{1}{c}\propto\frac{1}{d}\Rightarrow a\propto\frac{1}{d}$

77. (c) $M\propto\frac{1}{N}\Rightarrow M=\frac{k}{N}\rightarrow$ k is constant
When, M is 20 & N is 70
$\therefore 20=\frac{k}{70}\Rightarrow k=1400$
Now, if N = 50
$\Rightarrow M=\frac{k}{N}=\frac{1400}{50}=28$

Alternate Method:

$M\propto\frac{1}{N}$
$\Rightarrow M_1N_1=M_2N_2$
$\Rightarrow 20\times70=M_2\times50\Rightarrow M_2=28$

78. (d) $A\propto(B+18)$
$\Rightarrow A=k(B+18)$
$\Rightarrow 108=k(36+18)\Rightarrow k=2$
Now,
$\therefore A=2\times(68+18)=2\times86=172$

Alternate Method:

$A\propto(B+18)$

$\Rightarrow \frac{A_1}{B_1+18}=\frac{A_2}{B_2+18}$

$\Rightarrow \frac{108}{36+18}=\frac{A_2}{68+18}$

$\Rightarrow A_2=\frac{108\times86}{54}=172$

79. (c) Given,
A is directly proportional to B

$\Rightarrow \frac{A_1}{A_2}=\frac{B_1}{B_2}\Rightarrow\frac{52}{A_2}=\frac{91}{126}$

$\Rightarrow A_2=72$

80. (a) $M\propto\frac{1}{N^2+3}$

$\Rightarrow M=\frac{K}{N^2+3}$ ....(i)

If M = 3 when N = 3

$\Rightarrow 3=\frac{K}{3^2+3}\Rightarrow 3=\frac{K}{12}\Rightarrow K=36$

When $N^2=69$ then

$M=\frac{36}{69+3}=\frac{36}{72}=\frac{1}{2}$

81. (b) $A\propto\frac{\sqrt{B}}{C^3}$

$\Rightarrow \frac{A_1}{A_2}=\frac{\sqrt{B_1}}{\sqrt{B_2}}\times\frac{C_2^3}{C_1^3}$

$\Rightarrow \frac{15}{9}=\frac{\sqrt{27}}{\sqrt{B_2}}\times\frac{2^3}{2^3}$

$\Rightarrow \frac{27}{B_2}=\left(\frac{15}{9}\right)^2=\frac{225}{81}$

$\Rightarrow B_2=\frac{243}{25}$

82. (d) Marks ∝ Time
$\Rightarrow M=K\times\text{Time}\Rightarrow 70=K\times6$

$\Rightarrow K=\frac{35}{3}$

ATQ,

$\Rightarrow 90=K\,\text{Time}\Rightarrow 90=\frac{35}{3}\ \text{Time}$

$\Rightarrow \text{Time}=\frac{90\times3}{35}=\frac{54}{7}=7.7$ hours

83. (a) $f(x,y)=ax+\frac{b}{y}$

$f(0,1)=0+\frac{b}{1}\Rightarrow 15=b$

$f(1,15)=a+\frac{b}{15}\Rightarrow 2=a+\frac{15}{15}$

$\Rightarrow a=1$

$\therefore f(5,3)=ax+\frac{b}{y}=5+\frac{15}{3}$
$=5+5=10$

84. (b) $x\propto\frac{y^3}{z^2}\Rightarrow x=a\frac{y^3}{z^2}$
ATQ,
$\frac{1}{36}=a\times\frac{2^3}{3^2}\Rightarrow\frac{1}{36}=a\times\frac{8}{9}$

$\Rightarrow a=\frac{1}{32}$

ATQ,

$x=a\frac{y^3}{z^2}=\frac{1}{32}\times\frac{27}{25}$

$\therefore 800x=800\times\frac{1}{32}\times\frac{27}{25}=27$

85. (b) ATQ,
$y\propto(x+3)$
$\Rightarrow y=k(x+3)$ .....(i)
$\Rightarrow 8=k(1+3)\Rightarrow k=2,$
$y=2(x+3)$ .....(ii)
Again

$x\propto\frac{1}{z}\Rightarrow x=m\times\frac{1}{z}$ ......(iii)

$\Rightarrow 2=m\times\frac{1}{6}$

$\therefore m=12,$

$x=\frac{12}{z}$ ......(iv)

From (ii) and (iv), $\frac{y}{2}=x+3$

$\Rightarrow \left(\frac{y}{2}-3\right)=\frac{12}{z}\Rightarrow z(y-6)=24$

86. (b) Age ∝ number of rings
Value of tree ∝ Age
ATQ,

$\frac{40}{30}=\frac{50}{A}=\frac{50000}{V}$

$\Rightarrow A=\frac{30\times50}{40}=37.5$

and

$V=\frac{37.5\times50000}{50}=37500$

87. (b) ATQ,
$H\propto T^2\Rightarrow H=KT^2$, (K = constant)
$\Rightarrow 80=K\times(4)^2\Rightarrow K=5$
Again, $H=5\times(8)^2=320$ cm

Alternate Method:

$H\propto T^2$

Then, $\frac{H_1}{H_2}=\frac{T_1^2}{T_2^2}\Rightarrow\frac{80}{H_2}=\frac{(4)^2}{(8)^2}$

$\Rightarrow H_2=\frac{80\times8\times8}{4\times4}=320$ cm

88. (a) Let, the number be x

$\frac{(3-x)^2}{2-x}=4$

$\Rightarrow$ From options put $x=1$ satisfied the equation.

89. (c) ATQ,
Weight (W) ∝ (Radius)² × Thickness (T)

$\Rightarrow \frac{4}{1}=\frac{r_1^2}{r_2^2}\times\frac{16}{9}\Rightarrow\frac{r_1^2}{r_2^2}=\frac{9}{4}\Rightarrow\frac{r_1}{r_2}=\frac{3}{2}$
$=3:2$

90. (d) ATQ,
Weight ∝ Volume × Density
Let edge of first and second cube x and y respectively.

$\Rightarrow \frac{4}{1}=\left(\frac{x}{y}\right)^3\times\frac{27}{16}\Rightarrow\left(\frac{x}{y}\right)^3=\frac{64}{27}=\left(\frac{4}{3}\right)^3$

$\Rightarrow x:y=4:3$

08
Chapter

AGE

• TYPE – I •
BASIC QUESTIONS

1. The ages of Fatima and Ahmed are in the ratio of 3:8. The sum of their present ages is 44 years. The difference of their ages is:
SSC CHSL 26/10/2020 (Shift-03)
(a) 30 years (b) 11 years
(c) 24 years (d) 20 years

2. The ratio of a father's age to his son's age is 3:2. The product of the numbers representing their age is 486. The ratio of their ages after 5 years will be:
SSC CPO 10/11/2022 (Shift-03)
(a) 32 : 24 (b) 32 : 21
(c) 32 : 22 (d) 32 : 23

3. The ratio of a father's age to his son's age is 7 : 4. The product of the numbers representing their ages is 1372.The ratio of their ages after 8 years will be:
SSC CHSL 02/07/2024 (Shift-01)
(a) 19 : 13 (b) 19 : 12
(c) 19 : 11 (d) 19 : 14

4. The sum of the present ages of a father and son is 50 years. If after 5 years, the father's age will be 5 times the age of the son, then what was the father's age 5 years ago?
SSC CHSL 11/07/2024 (Shift-03)
(a) 36 years (b) 47 years
(c) 43 years (d) 40 years

5. The sum of the ages of a son and father is 52 years; After four years the father's age will be four times the son's age. What is the present age (in years) of the son?
SSC CHSL TIER-II 10/01/2024
(a) 9 years (b) 12 years
(c) 10 years (d) 8 years

6. The sum of the ages of 6 children born at the interval of two years each is 90 years. What is the age (in years) of the eldest child?
SSC CGL 19/09/2024 (Shift-02)
(a) 14 years (b) 20 years
(c) 10 years (d) 10 years

7. Hema is 20 years old and her sister Neha is 30 years old. How many years ago were their ages in the ratio of 3:5?
SSC CGL 23/09/2024 (Shift-02)
(a) 3 years (b) 2 years
(c) 7 years (d) 5 years

8. Nihira is 25 years old and Punith is 30 years old. How many years ago was the ratio of their ages 3 : 4?
SSC CGL 25/09/2024 (Shift-01)
(a) 20 years (b) 15 years
(c) 5 years (d) 10 years

9. The present ages (in years) of A and B are in the ratio of 3 : 4. Five years ago, the ratio of their ages was 2 : 3. What is the present age (in years) of A?
SSC CGL 18/09/2024 (Shift-02)
(a) 15 (b) 28
(c) 20 (d) 21

10. At present, A is thrice as old as B. C is 5 years elder than B. The sum of the ages of A, B, C is 75 years. The ratio of the age of B five years ago to the age of A three years from now is:
SSC CGL 09/09/2024 (Shift-02)
(a) 2 : 3 (b) 1 : 4
(c) 4 : 7 (d) 1 : 5

11. Ghanshyam is thrice as old as Akash. 10 years ago, Ghanshyam was four times as old as Akash.
What is the difference between their current ages (in years)?
SSC CGL 24/09/2024 (Shift-02)
(a) 65 (b) 50
(c) 55 (d) 60

12. My father is presently 25 years older than me. The sum of our ages 5 years ago was 39 years. Find my present age.
SSC CHSL 11/07/2024 (Shift-04)
(a) 15 years (b) 12 years
(c) 20 years (d) 13 years

13. A father is presently 3 times his daughter's age. After 10 years he will be twice as old as her. Find the daughter's present age.
SSC CHSL 08/07/2024 (Shift-01)
(a) 15 years (b) 10 years
(c) 20 years (d) 5 years

14. In the year 2000, Monu was 3 times his sister's age. In 2010, he was 24 years older than her. Find Monu's age in 2010.
SSC CHSL 04/07/2024 (Shift-01)
(a) 46 years (b) 52 years
(c) 38 years (d) 62 years

15. The age of the older of two boys is thrice that of the younger. 9 years ago it was five times that of the younger.Find the present age of each.
SSC CHSL 01/07/2024 (Shift-02)
(a) 15 years, 45 years
(b) 12 years, 36 years
(c) 17 years, 51 years
(d) 18 years, 54 years

16. The ages of A and B are in the ratio 4 : 7, respectively. After 8 years, the ratio of their ages will be 2 : 3. What is the sum of the ages of A and B (in years)?
SSC Phase XII 21/06/2024 (Shift-02)
(a) 38 (b) 36
(c) 42 (d) 44

17. The ratio of the ages of A and B is 3 : 4. Four years ago, the ratio of their ages was 5 : 7. What will be the ratio of the ages of A and B four years from now?
SSC PHASE IX 2022
(a) 6 : 7 (b) 5 : 6
(c) 4 : 5 (d) 7 : 9

18. The present ages of A and B are in the ratio 3 : 4. Twelve years ago, their ages were in the ratio 2 : 3. The sum of the present ages of A and B (in years) is:
SSC CPO 24/11/2020 (Shift-2)
(a) 72 (b) 60
(c) 84 (d) 48

19. The ratio of present ages (in years) of a father and son is 15 : 8. Six years ago, the ratio of their ages was 13 : 6. What is the father's present age?
SSC CHSL 19/10/2020 (Shift-03)
(a) 65 years (b) 58 years
(c) 45 years (d) 78 years

20. Amit's father is aged five times more than Amit. After 6 years, he would be three and a half times of Amit's age. After further 9 years, how many times of Amit's age would he be?
SSC CGL 24/09/2024 (Shift-01)
(a) $2\frac{3}{4}$ times
(b) $2\frac{1}{4}$ times
(c) $3\frac{2}{7}$ times
(d) $2\frac{3}{7}$ times

21. If the age of a person is four times the sum of the ages of his three children, and after 6 years his age will be twice the sum of the ages of his three children, then what is the present age of that person?
SSC CHSL TIER-II (18/11/2024)
(a) 60 years
(b) 56 years
(c) 45 years
(d) 30 years

22. The present ages of Ramu and Ravi are in the ratio of 4 : 3. After 5 years the ratio of their ages will be 5 : 4. Find their present ages, respectively
SSC Phase XII 26/06/2024 (Shift-02)
(a) 20 years, 15 years
(b) 15 years, 20 years
(c) 10 years, 15 years
(d) 12 years, 12 years

• TYPE – II •
BASED ON AVERAGE AGE

23. Three boys, on an average, are 25 years old, and their age are in the ratio of 3 : 5 : 7. What is the age of the youngest boy?

SSC CPO 27/06/2024 (Shift-02)

(a) 12 years
(b) 15 years
(c) 21 years
(d) 24 years

24. A family, consists of a father, mother and son. The ratio of their present ages is 8 : 5 : 2 and the present age of the father is 48 years. What will be the average age of family after 3 years ?

SSC CHSL 10/03/2023 (Shift-02)

(a) 30 years
(b) 31 years
(c) 33 years
(d) 35 years

25. The average age of A, B and C is 20 years. Two years ago the sum of the ages of A and B was 6 more than that of C. Find the present age of C?

SSC CGL TIER-II 26/10/2023

(a) 28 years (b) 29 years
(c) 26 years (d) 25 years

26. The average age of Ruby and Soni is 40 years. The ratio of their ages is 11 : 5, respectively. What is the age (in years) of Soni?

SSC CHSL 11/07/2024 (Shift-01)

(a) 15 (b) 55
(c) 30 (d) 25

27. The current average age of a family of five members is 24. If the present age of the youngest member in the family is 8 years, what was the average age of the family members just before the birth of this youngest member?

SSC MTS 07/07/2022 (Shift- 01)

(a) 24 years
(b) 20 years
(c) 28 years
(d) 16 years

28. 8 years ago, the average age of Rahul's family consisting of 6 members was 35 years. One year ago a new baby was born in this family. What will be the average age of the family four years hence?

[illegible] MTS 12/07/2022 (Shift- 02)

(a) 41 years (b) 37 years
(c) 40 years (d) 43 years

29. Six years ago, the average of the ages of Ravi, Mohan and Govind was 32 years. If Shyam joins them now, the average of the ages of all four of them is 36 years. The present age of Shyam is:

SSC CHSL 14/10/2020 (Shift-03)

(a) 35 years
(b) 32 years
(c) 40 years
(d) 30 years

• TYPE – III •
BASED ON DIFFERENCE OF AGE

30. Seven years ago, the ratio of the ages of A and B was 4 : 5. Eight years hence, the ratio of the ages of A and B will be 9 : 10. What is the difference between their present ages in years?

SSC CPO 25/11/2020 (Shift-1)

(a) 4 (b) 2
(c) 3 (d) 6

31. The ratio of the ages of A and B, four years ago, was 4 : 5. Eight years from now, the ratio of the ages of A and B will be 11 : 13. What is the sum of their present ages?

SSC CGL 4/06/2019 (Shift-01)

(a) 80 years (b) 96 years
(c) 72 years (d) 76 years

32. The ratio of the present age of two girls is 3 : 4. After two year the ratio will be 7 : 9. Which of the following statement (s) is/are correct?

I. Ratio of their ages after 10 year is 6 : 7.
II. Ratio of their ages after 12 years is 6 : 7.

SSC CHSL 17/03/2023 (Shift-03)

(a) Only II (b) Neither I nor II
(c) Both I and II (d) Only I

33. 10 years ago, the age of Sunita was thrice the age of her daughter Tanya. 10 years hence, the age of Sunita will be twice the age of Tanya. What is the ratio of their present ages?

SSC CGL 23/09/2024 (Shift-01)

(a) 3 : 7 (b) 7 : 3
(c) 2 : 7 (d) 7 : 2

34. Four years ago, Ravi was four times as old as Kavya. Seven years from now, Ravi will be three times as old as Kavya. Find the sum of their present ages.

SSC CHSL 10/07/2024 (Shift-01)

(a) 118 years (b) 122 years
(c) 117 years (d) 115 years

35. One year ago, the age of B was twice that of A. After 9 years, if the ratio of the ages of B and A would be 4 : 3, then the sum of their present ages is _____ years.

SSC CGL 24/09/2024 (Shift-03)

(a) 30 years (b) 15 years
(c) 17 years (d) 21 years

36. The ratio of the ages of A and B, 3 years ago, was 5 : 7. The ratio of their ages, 13 years from now, will be 9 : 11. If the present age of C is 11 years less than that of B, then the present age of C, in years, is:

SSC CGL 23/09/2024 (Shift-03)

(a) 23 (b) 36
(c) 31 (d) 20

37. One year ago, the ratio of the age (in years) of A to that of B was 4:3. The ratio of their respective ages, 3 years from now, will be 6:5. What will be the ratio of respective ages of A and B, 9 years from now?

SSC CGL TIER-II 11/09/2019

(a) 7 : 6 (b) 10 : 9
(c) 9 : 8 (d) 8 : 7

38. The age of a father will be double the age of his son ten years later. 10 years ago, the father's age was six times the age of the son. How many years from now, the ratio of their ages will be 3 : 2?

SSC CHSL 04/07/2024 (Shift-03)

(a) 35 (b) 30
(c) 20 (d) 25

39. Seven years ago, Prachi was four times as old as her daughter was at that time. Four years from now, Prachi will be two-and-a-half times as old as her daughter would then be. Find the sum of the present ages (in years) of Prachi and her daughter.

SSC CGL 09/09/2024 (Shift-02)

(a) 69 years (b) 77 years
(c) 49 years (d) 72 years

40. Three years ago, the age of a person was six times the age of his younger brother. Eight years later, the age of the person will be three years less than twice the age of his younger brother. Find the present ages of the person and his younger brother.

SSC CGL 19/09/2024 (Shift-02)

(a) 15 yrs. and 5 yrs.
(b) 5 yrs. and 15 yrs.
(c) 12 yrs. and 4 yrs.
(d) 4 yrs. and 12 yrs.

41. 5 years ago, the ratio of the age of A to that of B was 4:5. Five years hence, the ratio of the age of A to that of B will be 6:7. If, at present, C is 10 years younger than B, then what will be the ratio of the present age of A to that of C ?

SSC CGL TIER-II 12/09/2019

(a) 3:2 (b) 5:4
(c) 4:3 (d) 5:3

42. The ratio of the ages of A and B, 8 years ago, was 5 : 7. The ratio of their ages, 8 years from now, will be 9 : 11. If the present age of C is 13 years less than that of B, and the present age of D is 8 years less than that of the age of A, then the sum of the present ages of C and D, in years, is:

SSC PHASE IX 2022

(a) 47 (b) 55
(c) 43 (d) 53

43. 10 years ago, a man's age was 5 times of his son's age. 2 years hence, twice his age will be equal to 4 times the age of his son. What is the present age (in years) of the son?

SSC CHSL 04/07/2024 (Shift-02)

(a) 20 years (b) 16 years
(c) 18 years (d) 14 years

44. Ram is 20 years older than Rahul. 'n' years ago Ram was thrice as old as Rahul. '2n' years from now the ratio of the ages of Ram and Rahul will be 15 : 11. What is the value of 'n' ?

SSC CHSL 08/07/2024 (Shift-04)

(a) 15 (b) 10
(c) 30 (d) 20

45. The ratio of the ages of two friends is 4 : 3 which will become 6 : 5 after 4 years. What will be the sum of their ages (in years) after 22 years from now?

SSC CGL TIER-II (20/01/2025)

(a) 56 (b) 58
(c) 52 (d) 50

46. The present ages of Sweeta and Suman are in the ratio 4 : 5. Six years back, the ratio of their ages was 2 : 3. What is the present age of Sweets?

SSC CGL TIER-II (20/01/2025)

(a) 16 years (b) 12 years
(c) 8 years (d) 20 years

◆ TYPE – IV ◆
MISCELLANEOUS QUESTIONS

47. The ages of two friends, Ram and Ravi, differ by 7 years. Ram's mother Mayadevi is three times as old as Ram, and Ravi is four times as old as his brother Soham. The ages of Mayadevi and Soham differ by 65 years. Find the age of Mayadevi (in years).

SSC CGL 10/09/2024 (Shift-01)

(a) 69 years (b) 36 years
(c) 85 years (d) 45 years

48. In a family, the combined age of husband, wife and a son is 90 years. The husband is the oldest. The difference in the ages of the husband and wife is 1/3rd the age of their son. After 10 years, the age of the son would be half the age of his father. What is the present age of his mother (in years)?

SSC CGL 19/09/2024 (Shift-01)

(a) 40 (b) 45
(c) 35 (d) 30

49. P got married 15 years ago. Today her age is $1\frac{3}{5}$ times her age at the time of her marriage. At present her son's age is $\frac{1}{5}$ of her age. What was her son's age 4 years ago as a fraction of P's age at that time?

SSC CHSL 10/07/2024 (Shift-02)

(a) $\frac{1}{9}$ (b) $\frac{1}{8}$
(c) $\frac{5}{9}$ (d) $\frac{1}{10}$

50. Anil and Beena are friends, and the difference between their ages is 5 years. Anil's father Dinesh is three times as old as Anil, and Beena is twice as old as her sister Charu. The ages of Dinesh and Charu differ by 45 years. If Beena is older than Anil, then find the sum of the present ages of both Dinesh and Charu.

SSC CGL TIER-II (18/01/2025)

(a) 78 years
(b) 69 years
(c) 91 years
(d) 100 years

ANSWER KEY

1.	(d)	2.	(d)	3.	(b)	4.	(d)	5.	(d)	6.	(b)	7.	(d)	8.	(d)	9.	(a)	10.	(d)
11.	(d)	12.	(b)	13.	(b)	14.	(a)	15.	(d)	16.	(d)	17.	(d)	18.	(c)	19.	(c)	20.	(d)
21.	(a)	22.	(a)	23.	(b)	24.	(c)	25.	(c)	26.	(d)	27.	(b)	28.	(a)	29.	(d)	30.	(c)
31.	(a)	32.	(a)	33.	(b)	34.	(a)	35.	(c)	36.	(d)	37.	(c)	38.	(a)	39.	(a)	40.	(a)
41.	(b)	42.	(c)	43.	(d)	44.	(a)	45.	(b)	46.	(b)	47.	(a)	48.	(c)	49.	(a)	50.	(b)

SOLUTIONS

1. (d) F : A
Present → 3 : 8
Sum = 11 unit → 44 years
1 unit → 4 years
Diff. = 5 unit → 4 × 5 = 20 years

2. (d) Let age of father = $3x$
Age of son = $2x$
ATQ, Product of their age = 486
$\Rightarrow 3x \times 2x = 486 \Rightarrow x^2 = 81$
$\Rightarrow x = 9$
Age of father after 5 year
$= 3 \times 9 + 5 = 32$ yrs.
Age of son after 5 year
$= 2 \times 9 + 5 = 23$ yrs.
Required ratio = 32 : 23

3. (b)

$$\begin{tikzcd}[row sep=small] & \text{F} & : & \text{S} & \\ \text{Present age} \rightarrow & 7 \arrow[dr, bend right] & : & 4 \arrow[dr, bend right] & \\ & & 7x & & 4x \end{tikzcd}$$

ATQ,
$7x \times 4x = 1372$
$\Rightarrow x^2 = 49 \Rightarrow x = 7$

$$\begin{tikzcd} \text{Father} & & \text{Son} \\ 7 \times 7 \arrow[d, "+8"] & : & 4 \times 7 \arrow[d, "+8"] \\ 57 & & 36 \end{tikzcd}$$

Ratio→ 19 : 12
Hence, ratio of age of Father and Son = 19 : 12

4. (d) Sum of present age of father and son = 50 years
Sum of age of father & son after 5 yrs
= 50 + 10 = 60 years
ATQ,
F : S = 5 : 1
6 units → 60 years
1 unit → 10 years
Age of father 5 years ago
= 5 × 10 – 5 – 5 = 40 years

5. (d) Given,
Father + Son = 52 yrs
$x + y = 52$ yrs .... (i)
ATQ,
$(x + 4) = 4(y + 4)$
$\Rightarrow x - 4y = 12$ ..... (ii)
From, Eq^n (i) & Eq^n (ii)
$5y = 40 \Rightarrow y = 8$ yrs
∴ Present age of son = 8 yrs

Alternate Method:

	Father	Son
Present →	$4x - 4$	$x - 4$

After 4 yrs. → $4x$: x
ATQ,
$4x - 4 + x - 4 = 52$ yrs
$5x = 60 \Rightarrow x = 12$
∴ Present age of son = 12 – 4 = 8 yrs.

Alternate Method:

It is given in the question that father's age is 4 times of son's age after 4 years.

$$\begin{tikzcd} & \text{Father} & \text{Son} & \text{Sum of age} \\ \text{Present age} \arrow[dr, bend right, "\text{after 4 years}"'] & x \arrow[d, "+4"] & y \arrow[d, "+4"] & = 52 \arrow[d, "+8"] \\ & 4(y + 4) & (y + 4) & = 60 \end{tikzcd}$$

$4y + 16 + y + 4 = 60$
$y = 8$ years

6. (b) Given, $S_6 = 90 \Rightarrow d = 2$
Using the formula for sum of an A.P.

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$90 = 3[2a + 10]$
$a = \frac{20}{2} = 10$
Hence, eldest = 10 + (2 × 5) = 20 yrs.

Alternate Method:-

Let, the age of eldest child = x
ATQ,
$\Rightarrow x + (x - 2) + (x - 4) + (x - 6) + (x - 8) + (x - 10) = 90$
$\Rightarrow 6x - 30 = 90$
$\Rightarrow x = 20$
∴ the age of eldest child = x = 20 yrs.

7. (d) ATQ,

$$\frac{20 - x}{30 - x} = \frac{3}{5}$$

$\Rightarrow 100 - 5x = 90 - 3x$
$\Rightarrow 2x = 10 \Rightarrow x = 5$
5 years ago, the ratio of their ages will be 3 : 5.

8. (d) ATQ,

$$\frac{25 - x}{30 - x} = \frac{3}{4}$$

$\Rightarrow 100 - 4x = 90 - 3x \Rightarrow x = 10$ years.

Alternate Method:

$$\begin{tikzcd} & \text{N} & : & \text{P} \\ \text{n years ago} \rightarrow & 3 & : & 4 \\ \text{Present age} \rightarrow & 5 \arrow[u, bend left, "2"] & : & 6 \arrow[u, bend right, "2"'] \end{tikzcd}$$

∴ n = $\frac{25}{5}$ × 2 = 10 years

9. (a) Let, present age of A and B is $3x$ and $4x$.
ATQ,

$$\Rightarrow \frac{3x - 5}{4x - 5} = \frac{2}{3}$$

$= 9x - 15 = 8x - 10$
$\Rightarrow x = 5$
Present age of A is $3x = 3 \times 5 = 15$ yrs.

Alternate Method:

A B

Present → 3 : 4

−1 −1

5 yrs back → 2 : 3

ATQ,

1 units → 5 yrs.

∴ 3 units → 15 yrs.

10. (d) A : B : C

$3x$: x : $x+5$

ATQ,

$3x + x + x + 5 = 75$ years

$\Rightarrow 5x = 70 \Rightarrow x = 14$

∴ Ratio of age of B 5 years ago to Age of A three years after =

$x - 5 : 3x + 3 = 9 : 45 = 1 : 5$

11. (d)

G : A

10 yrs ago→ $(\underbrace{4 : 1}_{3})\times 2 \to 8 : 2$

1

Current→ $(\underbrace{3 : 1}_{2})\times 3 \to \underbrace{9 : 3}_{6\ \text{unit}}$

1 unit = 10 years

∴ Difference between their current age

6 unit = 6 × 10 = 60 years

12. (b) Father Son

5 years ago → $x + 20$ $x - 5$

present age → $x + 25$ x

ATQ,

$x + 20 + x - 5 = 39$

$\Rightarrow 2x = 24$

$\Rightarrow x = 12$

Hence, Present age of son = 12 yrs.

13. (b) Let the present age of daughter = x

Father Daughter

Present → $3x$ x

↓ +10 ↓ +10

After 10 yrs. → 2 : 1

ATQ,

$$\frac{3x+10}{x+10} = \frac{2}{1}$$

$\Rightarrow 3x + 10 = 2x + 20 \Rightarrow x = 10$ years

∴ Daughter's present age = 10 years

Alternate Method:

Father : Daughter

Present age→ $(3 : 1)_{\times 1} \to 3 : 1$

1 unit = 10 year

10 year after→ $(2 : 1)_{\times 2} \to 4 : 2$

∴ Daughter's present age

= 1 × 10 = 10 years

14. (a) ***Note:*** Difference of age is always same.

Monu Sister

In year 2000 → 3 1

diff. → 2 units

↓ ×12

24 years

Hence, Monu's age in 2010

= 3 × 12 + 10 = 46 years

15. (d) Older : Younger Diff.

9 yrs ago 5 : 1 4

Present → $3_{\times 3}$: $1_{\times 3}$ $2_{\times 2}$

5 : 1

6 : 2

1 unit = 9 yrs.

Present age of older = 9 × 6 = 54 yrs.

Present age of younger = 2 × 9 = 18 yrs.

16. (d)

Present age → $\overbrace{4 : 7}^{3}$ → 4 : 7

After 8 year → $(\underbrace{2 : 3}_{1})_{\times 3}$ → 6 : 9

2 unit → 8 years

11 unit → 44 years

17. (d)

A Diff = 2 B

4 years ago → 5 : 7

Present → $3_{\times 2}$: $4_{\times 2}$

Diff = 1

Present → 6 : 8

1 unit = 4 yrs.

A B

Then, present → 24 : 32

After 4 years → 28 : 36

7 : 9

18. (c) A B

12 year ago 2 : 3

Present → 3 : 4

1 unit

1 unit → 12 years

The sum of the present age of A and B (3 + 4) unit → 7 × 12

= 84 years

Alternate Method:

By option-

Option is divisible by 7

Option (c) 84 is right

19. (c) F S

6 year ago 13 : 6

Present → 15 : 8

2 unit

2 unit → 6 years

1 unit → 3 years

Present age of Father = 15 × 3

= 45 years

20. (d)

Father : Amit

Present → 6 : 1

1 1

after 6 years → 7 : 2

1 unit → 6 years

Father : Amit

Age after 6 yr → 7 × 6 : 2 × 6

= 42 = 12

9 yr later → ↓ +9 yr ↓ +9 yr

51 yr 21 yr

∴ Required ratio = $\frac{51}{21} = 2\frac{3}{7}$ times

21. (a) Let present age of person = p

ATQ,

$$\frac{p}{x+y+z} = \frac{4}{1} \quad \text{....(i)}$$

$$\frac{p+6}{(x+6+y+6+z+6)} = \frac{2}{1}$$

$\Rightarrow p + 6 = 2(x + y + z) + 36$ ....(ii)

Using eqⁿ (i)

$2(x + y + z) = 30 \Rightarrow x + y + z = 15$

∴ Present age of person

= 4 × 15 = 60 years

22. (a) Ramu Ravi

4 : 3

5 : 4

1 unit = 5

Then present age of Ramu = 4 unit = 4 × 5 = 20 years

Present age of Ravi = 3 unit = 3 × 5

= 15 years

23. (b) Sum of their age = 25 × 3 = 75

ATQ,

$3x + 5x + 7x = 75$

$15x = 75 \Rightarrow x = 5$

$3x = 5 \times 3 = 15$ years

Hence,

The age of youngest boy is 15 yrs.

Alternate Method:

Sum = 25 × 3 = 75

Ratio → 3 : 5 : 7

15 unit → 75 years

1 unit → 5 years

3 unit → 15 years

24. (c) F : M : S = 8 : 5 : 2

∵ $8x = 48 \Rightarrow x = 6$

Sum of age = $(8 + 5 + 2)x$

$= 15x = 90$ years

After 3 years total age

= 90 + 3 × 3 = 99 years

Avg. age after 3 years = $\frac{99}{3}$ = 33 yrs.

Alternate Method:

Father : Mother : Son Total age

$8x$: $5x$: $2x$ ⟶ $15x$

↓ ×6

48

After 3 years average age

$$= \frac{15x + 3\times 3}{3} \Rightarrow \frac{15\times 6 + 3\times 3}{3} = 33 \text{ yrs}$$

25. (c) Given that,

A + B + C = 20 × 3 = 60 yrs ..... (i)

ATQ,

(A − 2) + (B − 2) = (C − 2) + 6

∴ A + B − C = 8 yrs ..... (ii)

Solving equation (i) & (ii), we get

∴ C = 26 yrs.

26. (d) Sum of the age of Ruby and Soni

= 2 × 40 = 80 years.

Ruby : Soni

11 : 5 = 16 units

↓ ×5 ↓ ×5

$\boxed{25 \text{ yrs.}}$ 80

Hence, the present age of soni = 25 years

27. (b) Total age of five members

⇒ 5 × 24 = 120 year

8 year ago, total age of the family

= (120 − 40) = 80 year

∴ Average = $\frac{80}{4}$ = 20 year

28. (a) Total age of 6 members (present)

= 35 × 6 + 8 × 6 = 258 years

After four years = 4 × 6 = 24 year

After four year baby age = 5 year

Average of 7 members

$= \frac{258+24+5}{7} = \frac{287}{7} = 41$ yrs.

29. (d) Let the present age of Shyam be S

ATQ, R + M + G = 32 × 3 = 96

At present -

Avg. $= \frac{(R+6)+(M+6)+(G+6)+S}{4} = 36$

R + M + G + 18 + S = 36 × 4

96 + 18 + S = 36 × 4

S = 30 yrs.

Alternate Method:

By deviation method:-

$\underbrace{R+M+G}_{32+6=38\text{ yrs.}} + \underbrace{S}_{} = 36$

32 + 6 = 38 yrs. 36 − 6 = $\boxed{30 \text{ yrs.}}$

+2 × 3 = 6 − 6

30. (c)

A B

7 yrs. ago → 4 : 5

Present → 5 unit Diff = 5 unit

After 8 yrs. → 9 : 10

5 unit → 7 + 8 = 15 year

1 unit = 3 year

A B

Present age → 4 × 3 5 × 3

+7 +7

19 yrs. 22 yrs.

Diff.= 3 years

31. (a)

A : B

4 yrs. ago → $4_{\times 2}$: $5_{\times 2}$

Diff = 1

8 : 10

Present →

Diff. = 3 unit

After 8 yrs. → 11 : 13

Diff = 2

3 unit → 12 year

1 unit → 4 year

A B

Present age → 8 × 4 + 4 10 × 4 + 4

= 36 yrs. = 44 yrs.

Sum = 36 + 44 = 80 yrs.

32. (a) Let, present ages of Girls be 3*x* and 4*x*

ATQ,

$\frac{3x+2}{4x+2} = \frac{7}{9}$

⇒ 27*x* + 18 = 28*x* + 14 ⇒ *x* = 4

Present age of girls = 12 years and 16 years

I → Ratio of their ages after 10 years

$= \frac{12+10}{16+10} = \frac{22}{26} = \frac{11}{13}$ (Not 6 : 7)

II → Ratio of their ages after 12 years

$= \frac{12+12}{16+12} = \frac{24}{28} = \frac{6}{7}$

(satisfied)

Only II (satisfied)

Alternate Method:

I II Diff.

Present Age → 3 : 4 $1_{\times 2}$ ⇒ 6 : 8

After 2 years → 7 : 9 2 7 : 9

1 unit = 2yrs.

Present age of girls = 12 years and 16 years

I → ratio of their ages after 10 years

$= \frac{12+10}{16+10} = \frac{22}{26} = \frac{11}{13}$ (Not 6 : 7)

II → Ratio of their ages after 12 years is

$= \frac{12+12}{16+12} = \frac{24}{28} = \frac{6}{7}$

(satisfied)

Only II (satisfied)

33. (b) Given,

Sunita : Tanya

10 yrs. ago → 3 : 1

10 yrs. hence → $(2 : 1)_{\times 2}$

4 : 2

1 unit = 20 yrs.

1 unit = 20 years

4 unit = 80 years

2 unit = 40 years

∴ Present ratio of $\frac{S}{T} = \frac{80-10}{40-10} = \frac{7}{3}$

Alternate Method:

Given,

S − 10 = 3(T − 10)

⇒ 3T − S = 20 ......(i)

also, (S + 10) = 2 (T + 10)

⇒ S − 2T = 10 .....(ii)

(i) + (ii)

T = 30

⇒ S = 70

∴ $\frac{S}{T} = \frac{7}{3}$

34. (a)

Ravi : Kavya diff.

4 years ago → 4 : 1 ⇒ 3

Present age →

7 years later → 3 : 1 ⇒ 2

Now,

Ravi : Kavya

4 years ago → 8 : 2

Present age →

7 years later → 9 : 3

1 : 1

×11

11

Hence, sum of present age

= (8*x* + 2*x*) + 8 = 10*x* + 8

= 10 × 11 + 8 = 118 years.

35. (c)

A B

1 : 2 →(1 year before)

P → +10y +10y +2

3 : 4 →(9 year after)

2 unit = 10 years

1 unit = 5 years

3 unit = 15 years

Present age of (A + B) = 15 + 2

= 17 years

36. (d)

A : B

3 yrs. ago → 5 : 7

13 yrs. after → 9 : 11

4 unit = 16 yrs.

4 unit = 16 yrs.

5 unit = 20 yrs.

7 unit = 28 yrs.

Present age of B = 28 + 3 = 31 yrs.

Age of C = 31 − 11 = 20 years.

37. (c)

A B

1 yrs. ago → 4 : 3

Present → 2 unit 2 unit = 4 yrs.

After 3 yrs. → 6 : 5

6 yrs. 6 yrs. = 3 unit

9 : 8

38. (a)

Father : Son diff.

10 years ago → 6 : 1 ⇒ 5

Present age →

10 years later → 2 : 1 ⇒ 1

Father : Son

10 years ago → 6 : 1

Present age →

10 years later → 10 : 5

4 : 4

×5

20 years

Let, after y years, ratio of their age will be 3 : 2

ATQ,

$\frac{50-10+y}{25-10+y} = \frac{3}{2}$

⇒ 80 + 2y = 45 + 3y

⇒ y = 35

39. (a)

Prachi : Daughter

7 years ago → 4 : 1

Present 1 unit → 11 year

4 years after → 5 : 2

Present Age of Prachi = 4 × 11 + 7

= 51 years.

Present Age of Daughter

= 1 × 11 + 7 = 18 years

∴ Sum of present Age

= 51 + 18 = 69 years

40. (a) Let the elder person age is *x* and his brother age is y.

ATQ,

(*x* − 3) = (y − 3) × 6

6y − *x* = 15 ....(i)

(*x* + 8) = (y + 8)2 − 3

x + 8 = 2y + 13

x = 2y + 5 ....(ii)

From eq. (i) & (ii)

6y − 2y − 5 = 15

4y = 20

Hence, y = 5, *x* = 15

Alternate Method:-

Elder Younger

3 yrs. ago → 6 : 1

ATQ,

⇒ (6*x* + 3 + 8) = (*x* + 3 + 8) × 2 − 3

⇒ 6*x* + 11 = 2*x* + 22 − 3

⇒ 4*x* = 8 ⇒ *x* = 2

Present age of elder brother

= 6*x* + 3 = 15 yrs.

Present age of younger brother

= *x* + 3 = 5 yrs.

41. (b)

A : B

5 yrs. ago → 4 : 5

Present → 2 unit ↓ 2 unit ↓

After 5 yrs. → 6 : 7

10 yrs → 2 unit

5 yrs → 1 unit

Ratio of present age of A and B:

A : B

Ago → 4 : 5

+5yrs → +1 +1

Present → 5 : 6

Present age of A = 5 × 5 = 25 yrs

Present age of B = 6 × 5 = 30 yrs

Present age of C = B – 10

= 30 – 10 = 20 yrs.

Ratio of present age of A and C

A : C

25 : 20

5 : 4

42. (c) ATQ,

A B

8 yrs. ago → 5 : 7

Present → 4 unit ↓ 4 unit ↓

After 8 yrs. → 9 : 11

4 units → 16 years

1 unit → 4 years

Present age of A = 4 × 9 – 8 = 28 yrs.

Present age of B = 11 × 4 – 8 = 36 yrs.

Present Age of C = 36 – 13 = 23 years

Present Age of D = 28 – 8 = 20 years

Sum of ages of C and D = 23 + 20

= 43 years

43. (d) 2 Father = 4 Son

Father : Son = 2 : 1

Father : Son diff.

10 years ago → 5 : 1 ⇒4

Present age →

2 years later → 2 : 1 ⇒1

Now,

Father : Son

10 years ago → 5 : 1

Present age →

2 years later → 8 : 4

3 : 3

↓×4

12 years

Hence, present age of son

= 1× 4 + 10 = 14 years

Alternate Method:

10 years ago...

M – 10 = 5 (s – 10)

⇒ M – 10 = 5s – 50 ⇒ M – 5s = – 40

2 years hence...

2(M + 2) = 4(s + 2) ⇒ 2M + 4 = 4s + 8

2M – 4s = 4

2(5s – 40) – 4s = 4 ⇒ 10s – 80 – 4s = 4

6s – 80 = 4 ⇒ 6s = 84

s = 14

44. (a)

Ram : Rahul

n years ago → 3 : 1)$_{\times 5}$

$\cancel{2}$ 1

Present age →

2n years later → 15 : 11)$_{\times 1}$

$\cancel{4}$ 2

Now,

Ram : Rahul

n years ago → (6 : 2)diff. ⇒ 4 unit ↓×5 20

Present age →

2n years later → (15 : 11)

(15 – 6) unit $\xrightarrow{\times 5}$ 45 years

Then,

2n + n = 45

⇒ 3n = 45

⇒ n = 15

∴ Value of n = 15

Alternate Method:

Ram : Rahul

n year ago = 3 : 1

30 year diff. 10 year

2 unit → 20

1 unit → 10

$$\frac{30+n+2n}{10+n+2n}=\frac{15}{11}$$

330 + 33n = 150 + 45n

12n = 180

n = 15

45. (b) Present age = 4 : 3 = 1

After 4 years = 6 : 5 = 1

2 : 2 unit

2 unit = 4

1 unit = 2

Present age of first = 4 × 2 = 8 years

Present age of second = 3 × 2

= 6 years

Sum of age after 22 years

= 8 + 22 + 6 + 22 = 58

46. (b)

Sweeta Suman

6 years back → 2 : 3

Present → 4 : 5

2 2

2 unit = 6 years

1 unit = 3 years

Present age of Sweeta = 4 unit

= 4 × 3 = 12 years

47. (a)

Ram : Ravi : Mayadevi : Soham

$4x + 7$: $4x$: $12x + 21$: x

ATQ,

$12x + 21 – x = 65$

⇒ $11x = 44$ ⇒ $x = 4$

∴ Age of Mayadevi = $12x + 21 = 12 \times 4 + 21 = 69$ yrs.

48. (c) Given

H + W + S = 90 ....(1)

$H - W = \frac{1}{3}S$ ....(2)

Also, $S + 10 = \frac{1}{2}(H + 10)$

2S + 20 = H + 10

H = 2S + 10 ....(3)

From eq. (2) & (3)

6S + 30 – 3W = S

3W = 5S + 30

$W = \frac{5S}{3} + 10$

ATQ,

H + W + S = 90

$2S + 10 + \frac{5S}{3} + 10 + S = 90$

14S = 210, S = 15

$W = 5 \times \frac{15}{3} + 10 = 35$ years.

49. (a)

P's age at Marriage time : P's present Age : son's present age

5 : 8 : $\frac{8}{5}$

= 25 : 40 : 8

Diff.

15 years

$$\therefore \frac{\text{Son's age 4 years ago}}{\text{P's age 4 years ago}}$$

$$=\frac{8-4}{40-4}=\frac{4}{36}=\frac{1}{9}$$

Alternate Method:

Married : Present

P age = 5 : 8 ×5

diff. 40 year

3 unit → 15

1 unit → 5

Son's age 4 years ago = $40 \times \frac{1}{5} - 4$

= 4 years

$$\therefore \frac{\text{Son's age 4 years ago}}{\text{P's age 4 years ago}}$$

$$=\frac{8-4}{40-4}=\frac{4}{36}=\frac{1}{9}$$

50. (b) Let present age of Anil = x

Dinesh ↓ Anil ↓ Beena ↓ Charu ↓

Age → $3x$ x $x + 5$ $\frac{x+5}{2}$

ATQ,

$$3x-\frac{x+5}{2}=45$$

$6x – x – 5 = 90$

$x = 19$

Now,

$$\text{Dinesh + Charu} = 3x+\frac{x+5}{2}$$

$$=\frac{7x+5}{2}=\frac{7\times19+5}{2}=\frac{138}{2}=69$$

□□□□□

09

Chapter

PARTNERSHIP

◆ TYPE – I ◆
BASIC QUESTIONS

1. X, Y and Z invested ₹4,000, ₹6,000 and ₹8,000 respectively in a business. They invested the money for 3,2 and 4 years respectively. If the total profit is ₹56,000, then what is the share of Y in the profit?

SSC CHSL TIER-I 15/03/2023 (Shift-02)

(a) ₹12000 (b) ₹18000
(c) ₹15000 (d) ₹9000

2. A and B start a business jointly. The investment made by A is equal to seven times the investment made by B. Find A's share (in ₹) in the annual profit of ₹2,75,000 is.

SSC CHSL TIER-II 26/06/2023

(a) 2,41,225 (b) 2,40,625
(c) 2,42,365 (d) 2,45,625

3. A, B and C started a business investing amounts of ₹13,750 ₹16,250 and ₹18,750 respectively. If B's share in the profit is ₹5,200. What is the difference in the profit (in ₹) earned by A and C?

SSC MTS 11/09/2023 (Shift- 01)

(a) ₹1520 (b) ₹1600
(c) ₹1800 (d) ₹1200

4. A, B and C invested their capitals in the ratio of 2 : 3 : 5. The ratio of months for which A, B and C invested is 4 : 2 : 3. If C gets a share of profit which is ₹147,000 more than that of A, then B's share of profit is:

SSC CGL TIER-II 12/09/2019

(a) 126000 (b) 168000
(c) 105000 (d) 189000

5. Three partners shared the profit in a business in the ratio 8 : 7 : 5. They invested their capitals for 7 months, 8 months and 14 months, respectively. What was the ratio of their capitals?

SSC CPO 24/11/2020 (Shift-02)

(a) 49 : 64 : 20 (b) 20 : 49 : 64
(c) 20 : 64 : 49 (d) 64 : 49 : 20

6. A, B and C did certain investments and the ratio of their time periods is 3 : 2 : 7 respectively. Ratio of the profits of A, B and C is 4 : 3 : 14 respectively. What is the ratio of the investments of A, B and C?

SSC CGL TIER-II 02/03/2023

(a) 1 : 3 : 4 (b) 7 : 9 : 11
(c) 8 : 9 : 12 (d) 2 : 3 : 11

7. The ratio of investment by A to that by B in a business is 14 : 15 and the ratio of their respective profits at the end of a year is 2 : 5. If A invested the money for 3 months, then for how much time (in months) B invested his money?

SSC CGL TIER-II 11/09/2019

(a) 6 (b) 9
(c) 5 (d) 7

8. A, B and C started a business. A's capital is 7 times the capital of C and B's capital is 2 times the capital of A. If the profit is ₹7,920, then find the share of C (in ₹).

SSC MTS 13/09/2023 (Shift-03)

(a) 360 (b) 355
(c) 365 (d) 350

9. A, B and C invested money in a business such that 2 times A's share, 4 times B's share and 6 times C's share are all equal. If they earned Rs.44,000, find the share of A.

SSC CGL 24/09/2024 (Shift-01)

(a) ₹22,000 (b) ₹12,000
(c) ₹24,000 (d) ₹20,000

10. P, Q and R are partners and invest in a business. P invests 1/5th of total investments and Q invests 1/4th of the total investments. What is the ratio of investments of P, Q and R respectively?

SSC CHSL 13/03/2023 (Shift-01)

(a) 4 : 8 : 11 (b) 4 : 5 : 11
(c) 4 : 7 : 11 (d) 4 : 5 : 9

11. Three partners P, Q and R invested a total of ₹52,000 in a business. At the end of the year, P got ₹1430, Q got ₹1870 and R got ₹2420 as the share of profit. How much amount did Q invest in the business?

SSC MTS 13/06/2023 (Shift-03)

(a) ₹15300 (b) ₹20400
(c) ₹17000 (d) ₹18700

12. A, B, C invest a sum of ₹75,500 for a business. A invest ₹3,500 more than B, and B invest ₹4,500 more than C. Out of a total profit of ₹45,300, how much (in ₹) does A receive?

SSC CPO 25/11/2020 (Shift-02)

(a) ₹12,600 (b) ₹17,400
(c) ₹15,000 (d) ₹14,700

13. Arvind, Bilal and Carmen invest ₹49,000 in a business. Arvind invested ₹5,000 more than Bilal and Bilal invests ₹4,000 more than Carmen out of a total profit of ₹98,000, how much does Bilal receive?

SSC MTS 11/09/2023 (Shift- 01)

(a) ₹30,500 (b) ₹34,400
(c) ₹33,200 (d) ₹32,000

14. A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital. B invests 25% of the remaining, and C invests the rest. If the total profit at the end of the year is ₹1,86,000, then A's share of the profit (in ₹) is:

SSC CGL 13/04/2022 (Shift-03)

(a) 62,000 (b) 59,000
(c) 61,000 (d) 64,000

15. A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital, B invests 25% of the remaining and C, the rest. If the total profit at the end of the year is ₹219000, then A's share (in ₹) is:

SSC CGL 13/04/2022 (Shift -01)

(a) 65000 (b) 71000
(c) 73000 (d) 79000

16. A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital, B invest 25% of the remaining and C invests the rest. If the total profit at the end of a year is ₹162,000, then A's share in profit is:

SSC CGL TIER-II 12/09/2019

(a) ₹81000 (b) ₹60000
(c) ₹54000 (d) ₹90000

◆ TYPE – II ◆
WHEN SOMEONE JOINED OR LEFT

17. A starts a business with ₹45,000 and was joined afterwards by B with ₹30,000. When did B join if the profit at the end of the year was divided in the ratio 2 : 1?

Selection Phase-XI 30/06/2023 (Shift-04)

(a) After 6 month (b) After 12 month
(c) After 9 month (d) After 3 month

18. P invested ₹4000 for one year. Q joined him with an investment of ₹6000 after a few months. If at the end of one year the profits of P and Q is 4 : 3, then Q joined after how many months?

SSC CHSL 14/03/2023 (Shift-01)

(a) 4 months (b) 3 months
(c) 8 months (d) 6 months

19. A starts a business with ₹75,000 and B joins the business 5 months later with an investment of ₹80,000. After 1 year, they earn a profit of ₹4,08,800. Find the share of A and B (in ₹).

SSC CGL TIER-II 07/03/2023

(a) 2,52,000 and 1,56,800
(b) 2,50,000 and 1,58,800
(c) 2,48,000 and 1,60,800
(d) 2,49,500 and 1,59,300

20. A started a business with a capital of ₹54,000 and admitted B and C after 4 months and 6 months, respectively. At the end of the year, the profit was divided in the ratio 1 : 4 : 5. What is the difference between the capitals invested by B and C ?

SSC CGL TIER-II 11/09/2019

(a) 216000 (b) 324000
(c) 108000 (d) 162000

21. A and B enter into a partnership with ₹25,000 and ₹50,000, respectively, in a company for a year. After 7 months, C gets into a partnership with them with ₹30,000 and A withdraws his contribution after 9 months. What would be C's share in the profit, assuming a total profit of ₹3,900 at the end of the year?

SSC CHSL TIER-II 02/11/2023 (Shift-01)

(a) ₹1,200 (b) ₹800
(c) ₹600 (d) ₹1,000

22. A, B and C started a business with the investment of ₹100000, ₹140000 and ₹200000 respectively. After 3 months, C left the business. 7 months after C left the business, B also left the business. B and C took their investments with them. At the end of the year, C received his share of profit as ₹1155. What is the total share of profits of A and B?

SSC CGL TIER-II (08/08/2022)

(a) ₹6150 (b) ₹5555
(c) ₹5005 (d) ₹4995

23. Kapil initiated a business with an investment of ₹30,00,000 in April 2022. After six months, his friend Kunal joined him with an investment of ₹25,00,000. In February 2023, Kapil's Ex-Class fellow Saloni also invested an amount equal to the total investment made by the earlier two partners. In what ratio the profit earned after 3 years from the date on which Kapil initiated the business, will be distributed?

SSC CHSL 02/08/2023 (Shift-04)

(a) 332 : 200 : 50 (b) 108 : 75 : 143
(c) 432 : 300 : 55 (d) 432 : 400 : 55

• TYPE – III •
INCREASE/DECREASE IN CAPITAL

24. X and Y enter into a partnership with capital in the ratio 3 : 5. After 5 months X adds 50% of his capital, while Y withdraws 60% of his capital. What is the share (in lakhs ₹) of X in the annual profit of ₹6.84 lakhs?

SSC CGL TIER-II 15/11/2020 (Shift-01)

(a) 3.72 (b) 4.2
(c) 3.6 (d) 3.12

25. Suresh, Dinesh and Ramesh became partners in a business by investing money in the ratio of 3 : 6 : 8. If their investments is increased by 5%, 15% and 20%, respectively, then what will be the ratio of their profits for one year?

SSC CGL TIER-II 03/03/2023

(a) 7 : 46 : 64 (b) 19 : 46 : 64
(c) 21 : 46 : 64 (d) 35 : 46 : 64

26. A, B and C started a business in partnership. Initially, A invested ₹29,000, while B and C invested ₹25,000 each. After 4 months, A withdrew ₹3,000. After 2 more months, C invested ₹12,000 more. Find the share of C (in ₹) in the profit of ₹33,200 at the end of the year.

SSC CGL 11/04/2022 (Shift -02)

(a) 10800 (b) 10000
(c) 11067 (d) 12400

27. Three partners X, Y and Z started their business by investing ₹ 40,000, ₹38,000 and ₹ 30,000, respectively. After 6 months, X and Z made additional investments of ₹20,000 and ₹ 15,000 respectively, whereas Y withdrew ₹8,000. Find the share of Y (in ₹) in the total profit of ₹38,880 made at the end of the year.

SSC CGL 21/04/2022 (Shift -03)

(a) 10,950 (b) 10,200
(c) 9,800 (d) 10,880

28. A, B and C started a business with initial investments of ₹20000, ₹25000 and ₹10000, respectively. After 5 months from start, A invested ₹4000 more. After 6 months from start, C invested ₹8000 more. After 4 months from start, B withdrew ₹8000. At the end of the year, they will receive a profit of ₹'*x*'. In what ratio they will share the profits?

SSC CGL TIER-II (08/08/2022)

(a) 59 : 68 : 42
(b) 71 : 59 : 42
(c) 67 : 59 : 42
(d) 71 : 57 : 42

29. A, B and C started a business with their capitals in the ratio 2 : 3 : 5. A increased his capital by 50% after 4 months, B increased his capital by $33\frac{1}{3}\%$ after 6 months and C withdrew 50% of his capital after 8 months, from the start of the business. If the total profit at the end of a year was ₹86,800, then the difference between the shares of A and C in the profit was:

SSC CGL TIER-II 13/09/2019

(a) ₹12600 (b) ₹7000
(c) ₹9800 (d) ₹8400

30. A, B and C invested ₹40,000, ₹ 48,000 and ₹80,000, respectively, for a business at the start of a year. After 6 months, for the remaining time of the year, A added ₹ 4,000, B added ₹ 4,000 while C withdrew ₹ 4,000 every month. If the total profit is ₹6,72,000, then what is C's share (in ₹)?

SSC CGL 12/04/2022 (Shift-03)

(a) 196750 (b) 180480
(c) 211200 (d) 280320

• TYPE – IV •
BASED ON DONATION/TAX

31. Three people, A, B and C, invest in a business in the ratio 2 : 3 : 5. It was decided that 9% of the profits will go to charity. If the total profit was ₹2,50,000, then find the share of C in the profit (in ₹).

SSC CGL 26/09/2024 (Shift-01)

(a) 1,26,950 (b) 1,11,650
(c) 1,21,850 (d) 1,13,750

32. Mayur and Aham enter into a partnership by making investments in the ratio 2 : 3. 10% of the total profit goes to charity. If Aham's share is ₹4,860 then what is the total profit (in ₹) earned?

SSC MTS 11/09/2023 (Shift-03)

(a) 7,200 (b) 9,000
(c) 11,000 (d) 8,500

33. A and B invested money in a business in the ratio of 7 : 5. If 15% of the total profit goes for charity and A's share in the profit is ₹5,950 then what is the total profit?

SSC CGL 18/07/2023 (Shift-04)

(a) ₹12,500 (b) ₹12,000
(c) ₹10,500 (d) ₹11,750

34. Three partners decided to start a business. They decided to donate 10% of the profit to a charity organisation and then the remaining profit would be shared among first, second and third partner in the ratio 1 : 2 : 2. The total profit received was ₹1,80,000. Find the share of the first partner.

SSC Phase-XII 26/06/2024 (Shift-01)

(a) ₹31,800 (b) ₹29,600
(c) ₹33,200 (d) ₹32,400

• TYPE – V •
BASED ON DISTRIBUTION

35. Keshav, Surjeet and Thomas started a business with investments in the ratio 2 : 3 : 4. The ratio of their period of investments is 5 : 6 : 9. Twenty percent of the profit was spent on rent and maintenance of the office. Remaining profit was distributed among themselves. If the difference in the shares of profit of Keshav and Surjeet is ₹7264, then how much is the total profit (in ₹)?

SSC CGL 18/08/2021 (Shift-01)

(a) 51060 (b) 58112
(c) 46490 (d) 72640

36. Two friends A and B started a business by investing ₹1,50,000 and ₹2,50,000, respectively. They agreed to distribute their earnings in the same ratio of their investments. After an year, the profit earned was ₹6,00,000. Each of them added ₹50,000 to their respective profits and invested in a different project. If this project gave an yield of ₹4,20,000, then A's share in the profit is:

SSC CGL TIER-II 26/10/2023

(a) 1,97,000 (b) 2,35,000
(c) 1,65,000 (d) 1,84,000

◆ TYPE – VI ◆
BASED ON MANAGEMENT

37. A is a working partner and B is a sleeping partner in a business. A invested ₹30,000 and B invested ₹50,000. A receives 20% of the profit for managing the business and the rest is divided in proportion to their capital. What does B get out of the profit of ₹10,000.
SSC CHSL 02/08/2023 (Shift-02)
(a) ₹5500 (b) ₹5000
(c) ₹4500 (d) ₹4000

38. A, B and C jointly started a business in which A invested ₹7,000 for 12 months, B invested ₹8,000 for 10 months and C invested Rs.12,000 for 6 months. A was the working member for which he received 20% of the profits as his remuneration. The total profit earned at the end of one year was ₹14,750. What is C's share (in ₹) in the profit?
SSC CHSL TIER-II (18/11/2024)
(a) 2950
(b) 3600
(c) 4000
(d) 4200

◆ TYPE – VII ◆
MISCELLANEOUS QUESTIONS

39. P and Q start a shop with a capital of ₹1,50,000 and ₹4,50,000, respectively. After a year, out of the profit of ₹2,00,000, P gets his share of profit plus some money as his salary that is not a part of the profit. If P gets a total of ₹ 90,000, what is the amount of salary (in ₹) that he received?
SSC CGL TIER-II 03/02/2022 (Shift-01)
(a) 30,000
(b) 45,000
(c) 35,000
(d) 40,000

40. P and Q start a shop with a capital of ₹1,50,000 and ₹4,50,000, respectively. After a year, out of the profit of ₹1,60,000. P gets his share of profit plus some money that is not a part of the profit, as his salary. If P gets a total of ₹70,000, what is the salary (in ₹) he received:
SSC CGL 13/04/2022 (Shift -02)
(a) 25,000
(b) 50,000
(c) 30,000
(d) 40,000

ANSWER KEY

1.	(a)	2.	(b)	3.	(b)	4.	(a)	5.	(d)	6.	(c)	7.	(d)	8.	(a)	9.	(c)	10.	(b)
11.	(c)	12.	(b)	13.	(d)	14.	(a)	15.	(c)	16.	(c)	17.	(d)	18.	(d)	19.	(a)	20.	(a)
21.	(c)	22.	(c)	23.	(b)	24.	(a)	25.	(c)	26.	(d)	27.	(d)	28.	(c)	29.	(a)	30.	(d)
31.	(d)	32.	(b)	33.	(b)	34.	(d)	35.	(d)	36.	(c)	37.	(b)	38.	(b)	39.	(d)	40.	(c)

SOLUTIONS

1. (a)

$$\begin{array}{rccccc} & X & & Y & & Z \\ \text{Investment} \rightarrow & 4000 & : & 6000 & : & 8000 \\ \text{Time} \rightarrow & 3 & : & 2 & : & 4 \\ \hline \text{Profit} \rightarrow & 12 & : & 12 & : & 32 \\ & 3 & : & 3 & : & 8 \; = 14 \end{array}$$

$3 \xrightarrow{\times 4000}$ Rs.12000 $\quad 14 \xrightarrow{\times 4000}$ Rs.56000

2. (b) A : B = 7 : 1

$$\text{A's share} = \frac{7}{8} \times 275000 = 240625$$

SMART APPROACH:-
Check the multiple of 7.
In the given options, 240625 is the multiple of 7.

3. (b) Investment × Time = Profit

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Investment} \rightarrow & 13750 & : & 16250 & : & 18750 \\ & 11 & : & 13 & : & 15 \\ \hline \text{Profit} \rightarrow & 11 & : & 13 & : & 15 \end{array}$$

B = 13 unit → 5200
A – C = 4 unit = 1600

4. (a)

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Investment} \rightarrow & 2 & : & 3 & : & 5 \\ \text{Time} \rightarrow & 4 & : & 2 & : & 3 \\ \hline \text{Profit} \rightarrow & 8 & : & 6 & : & 15 \end{array}$$

Diff. of C & A = 15 – 8 = 7 unit
7 unit → 147000
1 unit → 21000
B's Share → 21000 × 6 = ₹126000

5. (d) $\text{Investment} = \dfrac{\text{Profit}}{\text{Time}}$

$$\begin{array}{rccccc} & A & : & B & : & C \\ \text{Profit} \rightarrow & 8 & : & 7 & : & 5 \\ \text{Time} \rightarrow & 7 & : & 8 & : & 14 \\ \hline \text{Investment} \rightarrow & \left(\frac{8}{7}\right. & : & \frac{7}{8} & : & \left.\frac{5}{14}\right) \times 56 \\ & = 64 & : & 49 & : & 20 \end{array}$$

6. (c) Investment × Time = Profit

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Time} \rightarrow & 3 & : & 2 & : & 7 \\ \text{Profit} \rightarrow & 4 & : & 3 & : & 14 \\ \hline \text{Investment} \rightarrow & \frac{4}{3} & : & \frac{3}{2} & : & \frac{14}{7} \end{array}$$

Required Ratio = 8 : 9 : 12

7. (d) Investment × time = profit

$$\begin{array}{rccc} \text{Investment} \rightarrow & 14 & : & 15 \\ \text{Time} \rightarrow & 3 & : & x \\ \hline \text{Profit} \rightarrow & 2 & : & 5 \end{array}$$

$$\frac{A \rightarrow 14 \times 3}{B \rightarrow 15 \times x} = \frac{2}{5} \Rightarrow x = 7$$

8. (a) ATQ,
A = 7 × C ⇒ A : C = 7 : 1

$$B = 2 \times A \Rightarrow \frac{B}{A} = \frac{2}{1} = \frac{14}{7}$$

$$\begin{array}{rccccc} & A & B & C & & \text{Total} \\ \text{Inv.} \rightarrow & 7 & 14 & 1 & = & 22 \text{ unit} \\ & & & \downarrow & & \downarrow \\ & & & \boxed{360} & & 7920 \end{array}$$

9. (c) ATQ,
2A = 4B = 6C

$$\begin{array}{rcccccc} & A & : & B & : & C & \\ \text{Investment ratio} \rightarrow & 6 & : & 3 & : & 2 & \Rightarrow 11 \text{ unit} \end{array}$$

$6 \xrightarrow{\times 4000} 24000 \qquad 11 \text{ unit} \xrightarrow{\times 4000} 44000$

∴ A's share of income = 24000

10. (b) L.C.M of 5, 4 = 20

$$P = 20 \times \frac{1}{5} = 4, \quad Q = 20 \times \frac{1}{4} = 5$$

Remaining (R) = 20 –(4 + 5) = 11
∴ P : Q : R = 4 : 5 : 11

11. (c)

$$\begin{array}{rccccc} & P & & Q & & R \\ \text{Profit} \rightarrow & 1430 & : & 1870 & : & 2420 \\ & 13 & : & 17 & : & 22 = 52 \text{ unit} \\ & & & \downarrow & & \downarrow \\ & & & 17000 & & 52000 \end{array}$$

12. (b)

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Investment} \rightarrow & x + 8000 & & x + 4500 & & x \\ & \downarrow & & \downarrow & & \downarrow \\ & 29000 & & 25500 & & 21000 \\ \text{Profit} \rightarrow & 58 & : & 51 & : & 42 \end{array}$$

3x + 12500 = 75500 ⇒ x = 21000
(58 + 51 + 42) = 151 unit → 45300

$$58 \text{ unit} \rightarrow \frac{45300}{151} \times 58 = 17400$$

13. (d)

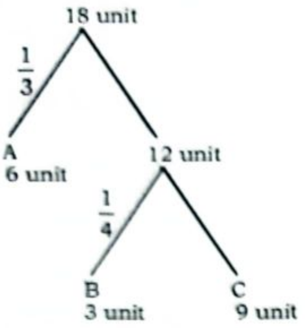
$$\begin{array}{rccccc} & \text{Arvind} & & \text{Bilal} & & \text{Carman} \\ I \rightarrow & x + 9000 & & x + 4000 & & x \\ & \downarrow & & \downarrow & & \downarrow \\ & 21000 & & 16000 & & 12000 \\ \text{Profit} \rightarrow & 21 & : & 16 & : & 12 \end{array}$$

$3x + 13000 = 49000$
$\Rightarrow x = 12000$
$(21 + 16 + 12)$ unit → 98000

$$\begin{tikzcd} 49 \text{ unit} \arrow[r] \arrow[d, phantom] & 98000 \\ 16 \text{ unit} \arrow[r] & 32000 \end{tikzcd}$$

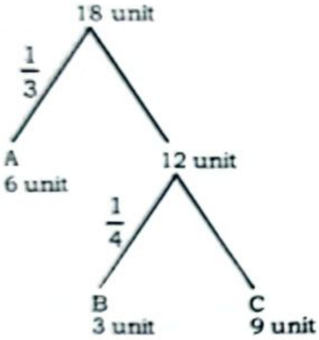
×2   ×2

14. (a) Let, $33\frac{1}{3}\% = \frac{1}{3}$ and $25\% = \frac{1}{4}$
Let total capital = 18 unit



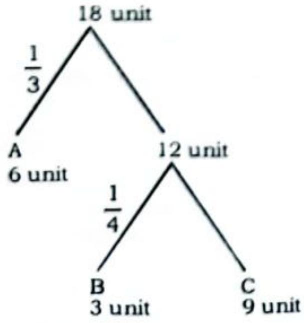
A : B : C = 6 : 3 : 9
Here, 18 units → ₹186000
∴ 6 units → ₹62000

15. (c) $33\frac{1}{3}\% = \frac{1}{3}$ and $25\% = \frac{1}{4}$
Let total capital = 18 unit



$$\begin{array}{cccc} A & B & C & \text{Total} \\ 6 & 3 & 9 & = 18 \text{ unit} \\ \downarrow & & & \downarrow \\ \boxed{73000} & & & 219000 \end{array}$$

16. (c) $33\frac{1}{3}\% = \frac{1}{3}$ and $25\% = \frac{1}{4}$
Let total capital = 18 unit



$$\begin{array}{cccc} A & B & C & \text{Total} \\ 6 & 3 & 9 & = 18 \text{ unit} \\ \downarrow & & & \downarrow \\ \boxed{54000} & & & 162000 \end{array}$$

17. (d)

$$\begin{array}{rcc} & A & B \\ \text{Investment} \rightarrow & 45000 & 30000 \\ \text{Time} \rightarrow & 12 & x \\ \hline \text{Profit} \rightarrow & 2 \quad : & 1 \end{array}$$

$$\frac{45000 \times 12}{30000x} = \frac{2}{1}$$

$$\Rightarrow x = \frac{45000 \times 12}{30000 \times 2} = 9 \text{ months}$$

B's joined after 3 months.

18. (d) If Q joined P for x months

$$\begin{array}{rccc} \text{Investment} \rightarrow & 4000 & : & 6000 \\ \text{Time} \rightarrow & 12 & : & x \\ \hline \text{Profit} \rightarrow & 4 & : & 3 \end{array}$$

$$\frac{4000 \times 12}{6000 \times x} = \frac{4}{3} \Rightarrow x = 6 \text{ months}$$

Q joined P after (12 – 6) = 6 months

19. (a)

$$\begin{array}{rcccl} & A & & B & \\ & 75{,}000 & : & 80{,}000 & \\ \text{Investment} \rightarrow & 15 & : & 16 & \\ \text{Time} \rightarrow & 12 & : & 7 & \\ \hline \text{Profit} \rightarrow & 45 & : & 28 & = 73 \\ & \downarrow & & \downarrow & \downarrow \times 5600 \\ & & & & 408800 \\ & 252000 & & 156800 & \end{array}$$

20. (a)

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Profit} \rightarrow & 1 & & 4 & & 5 \\ \text{Time} \rightarrow & 12 & & 8 & & 6 \\ \hline \text{Investment} \rightarrow & \left(\frac{1}{12}\right. & : & \frac{4}{8} & : & \left.\frac{5}{6}\right) \times 24 \\ & = 1 & : & 6 & : & 10 \end{array}$$

$$\underbrace{6 \quad 10}_{\text{Diff. } 4}$$

$$\begin{array}{cc} 1 \downarrow & 4 \downarrow \\ 54000 & 216000 \end{array}$$

21. (c) Investment × Time = Profit

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Investment} \rightarrow & 5 & : & 10 & : & 6 \\ \text{Time} \rightarrow & 9 & : & 12 & : & 5 \\ \hline \text{Profit} \rightarrow & 45 & : & 120 & : & 30 \\ \rightarrow & 3 & : & 8 & : & 2 = 13 \end{array}$$

$$13 \xrightarrow{\times 300} \text{Rs.}3900$$

∴ C's share = 2 × 300
= ₹600

22. (c) A's profit = 1,00,000 × 12
= 12,00,000
B's profit = 1,40,000 × 10 = 14,00,000
C's profit = 2,00,000 × 3 = 6,00,000
A : B : C = 6 : 7 : 3
3 unit → 1155
13 unit → 385 × 13 = 5005

Alternate method:

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Investment} \rightarrow & 10 & & 14 & & 20 \\ \text{Time} \rightarrow & 12 & & 10 & & 3 \\ \hline \text{Profit} \rightarrow & 120 & : & 140 & : & 60 \\ & 6 & : & 7 & : & 3 \end{array}$$

$$\underbrace{6 + 7}_{13 \times 385 = 5005} \qquad 3 \xrightarrow{\times 385} 1155$$

23. (b)

$$\begin{array}{rccccc} & \text{Kapil} & & \text{Kunal} & & \text{Saloni} \\ \text{Investment} \rightarrow & 30 & : & 25 & : & 55 \\ \text{Time} \rightarrow & 36 & : & 30 & : & 26 \\ & 6 & : & 5 & : & 11 \\ & 18 & : & 15 & : & 13 \\ \hline \text{Profit} \rightarrow & 108 & : & 75 & : & 143 \end{array}$$

24. (a) Let capital of X : Y = 30 : 50

$$\begin{array}{ccc} X & : & Y \\ (30 \times 5 + 45 \times 7) & : & (50 \times 5 + 20 \times 7) \\ 465 & : & 390 \\ 31 & : & 26 \end{array}$$

Share of X = $\frac{31}{57} \times 6.84$ = ₹3.72 lakh

25. (c)

$$\begin{array}{rccccc} & S & & D & & R \\ \text{Initial} \rightarrow & 300 & : & 600 & : & 800 \\ \text{Final} \rightarrow & 315 & : & 690 & : & 960 \end{array}$$

We know that when time is constant,
Profit ∝ Investment
Thus, Ratio of profit = 315 : 690 : 960
= 21 : 46 : 64

26. (d)

$$\begin{array}{rccccc} & A & & B & & C \\ & 29_{\times 4} & & 25_{\times 12} & & 25_{\times 6} \\ & 26_{\times 8} & & & & 37_{\times 6} \\ \hline & 324 & & 300 & & 372 \\ \text{Profit} \rightarrow & 27 & : & 25 & : & 31 \end{array}$$

C's share = $\frac{31}{83} \times 33200 = 12400$

27. (d) X, Y and Z started their business by investing ₹40,000, ₹38,000 and ₹30,000 respectively.

	X	Y	Z
For 6 months	40,000	38,000	30,000
For next 6 months	60,000	30,000	45,000
Profit	100 :	68 :	75

Share of Y = $\frac{38880}{243} \times 68$
= 10880

Alternate method:

$$\begin{array}{rcccccl} & X & & Y & & Z & \\ \text{Investment} \rightarrow & 40_{\times 6} & : & 38_{\times 6} & : & 30_{\times 6} & \\ \rightarrow & 60_{\times 6} & : & 30_{\times 6} & : & 45_{\times 6} & \\ \hline & 600 & : & 408 & : & 450 & \\ \text{Profit} \rightarrow & 100 & : & 68 & : & 75 & = 243 \\ & & & \downarrow \times 160 & & & \downarrow \times 160 \\ & & & 10880 & & & 38880 \end{array}$$

28. (c) ATQ,
A's profit = 20,000 × 5 + 24,000 × 7
= 2,68,000
B's profit = 25,000 × 4 + 17,000 × 8
= 2,36,000
C's profit = 10,000 × 6 + 18,000 × 6
= 1,68,000
Profit Ratio → 268 : 236 : 168
67 : 59 : 42

Alternate Method:

$$\begin{array}{rccccc} & A & & B & & C \\ \text{Investment} \rightarrow & 20_{\times 5} & : & 25_{\times 4} & : & 10_{\times 6} \\ \rightarrow & 24_{\times 7} & : & 17_{\times 8} & : & 18_{\times 6} \\ \hline & 268 & : & 236 & : & 168 \\ \text{Profit} \rightarrow & 67 & : & 59 & : & 42 \end{array}$$

29. (a)

A : B : C

$200\times4+300\times8$: $300\times6+400\times6$: $500\times8+250\times4$

3200 : 4200 : 5000

16 : 21 : 25

62 unit → 86800
1 unit → 1400
Difference of A and C
= 9 × 1400
= ₹12600

30. (d) After 6 months, for the remaining time of the year, A added ₹4000, B added ₹4000 and C withdrew ₹4000 every month.

So, $(4000\times6)+(4000\times5)+(4000\times4)+(4000\times3)+(4000\times2)+(4000\times1)$
$= 4000\times21 = 84000$

A : B : C = [(40000 × 12) + 84000] : [(48000 × 12) + 84000] : [(80000 × 12) – 84000]
= (480000 + 84000) : (576000 + 84000) : (960000 – 84000)
= 564000 : 660000 : 876000
= 564 : 660 : 876
= 47 : 55 : 73

Share of C = $\frac{73}{175}\times672000 = 280320$

31. (d) Distributed profit

$= 250000\times\frac{91}{100} = 227500$

Profit = Investment × time

	A	B	C		Total
Inv. →	2	3	5	=	10 unit
			↓		↓
			$\boxed{113750}$		227500

32. (b)

$$\begin{tikzcd}
 & \text{Mayur} & & \text{Aham} \\
\text{Investment} \rightarrow & 2 & : & 3 \\
\text{Profit} \rightarrow & 2 \arrow[rr, bend right, "+"] & : & 3 \arrow[d, "\times1620"] \\
 & 5\text{ unit} \arrow[d, "\times1620"'] & & 4860 \\
 & \text{Rs.}8100 & &
\end{tikzcd}$$

∴ Total Profit = $\frac{8100}{90}\times100$= ₹ 9000

33. (b)

$$\begin{tikzcd}
 & A & & B & \\
\text{Investment} \rightarrow & 7 & : & 5 & \\
\text{Profit} \rightarrow & 7 \arrow[rr, bend right, "+"] \arrow[d, "\times850"] & : & 5 & = 12\text{ unit} \arrow[d, "\times850"] \\
 & 5950 & & & 10200
\end{tikzcd}$$

Total profit = $\frac{10200}{85}\times100$ = ₹12000

34. (d) Distributed profit

$= 1,80,000\times\frac{90}{100} = 1,62,000$

$$\begin{tikzcd}
\text{Partners} \rightarrow & \text{1st} & & \text{2nd} & & \text{3rd} & & \text{Total} \\
\text{Share} \rightarrow & 1 \arrow[d, "\times32,400"] & : & 2 & : & 2 & = & 5 \arrow[d, "\times32,400"] \\
 & \text{Rs.}32,400 & & & & & & 1,62,000
\end{tikzcd}$$

35. (d) Profit = investment × time

	K		S		T
Investment →	2	:	3	:	4
Time →	5	:	6	:	9
Profit →	5	:	9	:	18

80% of profit distributed in their respected ratio of profit.

Difference between profit of keshav and surjeet = $\frac{(9-5)\times80}{100}$ = 3.2 units

3.2 units → 7264
32 units → ₹72640

Alternate method:

	K		S		T
Investment →	2	:	3	:	4
Time →	5	:	6	:	9
Profit →	5	:	9	:	18

Difference between profit of keshav and surjeet = 7264
4 unit = 7264

32 units = $\frac{7264}{4}\times32 = 58112$

Which is 80% of profit

Total profit = $58112\times\frac{100}{80}$ = ₹72640

36. (c)

	A	:	B
Investment →	3	:	5
Profit →	4.5	:	7.5

[Considering 50,000 as 1 unit]

$\left[\frac{6,00,000}{50,000}=12\right]$

Since 50,000 = 1 unit

A : B
New Profit → 5.5 : 8.5

Share of A = $\frac{5.5}{14}\times420000$
= ₹165000

Note:- Check multiple of 11 in the given option only option (c) satisfy.

37. (b)

Invest → $\frac{A}{3}$: $\frac{B}{5}$
20% of profit received by A
80% of profit = ₹8000

Share of B = $\frac{5}{8}\times8000$ = ₹ 5000

38. (b)

	A	:	B	:	C
Investment →	7	:	8	:	12
Time →	12	:	10	:	6
Profit →	84	:	80	:	72
=	21	:	20	:	18

100% = 14750
80% = Rs.11800

Share of C = $\frac{18}{21+20+18}\times11800 = \frac{18}{59}\times11800 = 3600$

39. (d)

P : Q
150,000 : 450,000
1 : 3

Share of P out of profit

$= \frac{1}{4}\times200,000 = 50,000$

But he get 90,000
Salary = 90,000 – 50,000 = ₹40,000

40. (c) P : Q = 150000 : 450000 = 1 : 3

P get from the profit = $\frac{1}{4}\times160000$
= ₹40000

P gets total amount = ₹ 70000
Salary of P = 70000 – 40000
= ₹ 30000

SPEED BOOSTER HACKS

◆ Cubes from 1 to 30, you should remember ◆

$(1)^3 = 1$	$(6)^3 = 216$	$(11)^3 = 1331$	$(16)^3 = 4096$	$(21)^3 = 9261$	$(26)^3 = 17576$
$(2)^3 = 8$	$(7)^3 = 343$	$(12)^3 = 1728$	$(17)^3 = 4913$	$(22)^3 = 10648$	$(27)^3 = 19683$
$(3)^3 = 27$	$(8)^3 = 512$	$(13)^3 = 2197$	$(18)^3 = 5832$	$(23)^3 = 12167$	$(28)^3 = 21952$
$(4)^3 = 64$	$(9)^3 = 729$	$(14)^3 = 2744$	$(19)^3 = 6959$	$(24)^3 = 13824$	$(29)^3 = 24389$
$(5)^3 = 125$	$(10)^3 = 1000$	$(15)^3 = 3375$	$(20)^3 = 8000$	$(25)^3 = 15625$	$(30)^3 = 27000$

10 Chapter

MIXTURE & ALLIGATION

◆ TYPE – I ◆ BASED ON ADDITION OR REMOVAL

1. A mixture contains milk and water in the ratio 9 : 7. If it contains 4 litres more milk than water, then find the quantity of milk (in litres) in the mixture.

SSC MTS 04/09/2023 (Shift-01)

(a) 18 (b) 15
(c) 21 (d) 14

2. If a mixture of 60 liters of milk contains 40% milk, how much more milk needs to be added to make the amount of milk in the mixture 60%?

SSC CPO 03/10/2023 (Shift-03)

(a) 30 liter (b) 20 liter
(c) 35 liter (d) 25 liter

3. A mixture of 70 litres of wine contains 10% of water. How much water must be added to make the water $12\frac{1}{2}$ % of the resulting mixture?

SSC CHSL 14/08/2023 (Shift-03)

(a) 5 litres (b) 3 litres
(c) 2 litres (d) 4 litres

4. A mixture of 750 kg of alloy of copper and tin contains 25% tin. How much tin must be added so that it becomes 70% of the mixture?

SSC CPO 27/06/2024 (Shift-02)

(a) 895 kg (b) 1125 kg
(c) 956 kg (d) 1097 kg

5. There is a 25 litre mixture of milk and water, containing milk and water in the ratio 3 : 2. Find how much litres of water that should be added to the mixture so that the resultant mixture has 50% water in it.

SSC MTS 01/09/2023 (Shift-02)

(a) 8 (b) 12
(c) 10 (d) 5

6. A 12 litre solution of acid and water contains 30% acid. How much water (in litres) must be added to get a solution having 20% acid?

SSC CPO 27/06/2024 (Shift-01)

(a) 6 (b) 3
(c) 5 (d) 4

7. If 49 litres of a milk solution has 63% milk in it, then how much milk should be added to make the concentration of milk 70% in the solution?

SSC CHSL 25/05/2022 (Shift- 02)

(a) $11\frac{13}{30}$ litres (b) $14\frac{7}{30}$ litres
(c) $12\frac{11}{30}$ litres (d) $13\frac{1}{30}$ litres

8. How much water should be added to 60 liters of milk at $1\frac{1}{2}$ liters a rupee so as to have a mixture worth $1\frac{7}{8}$ liters a rupee?

SSC CHSL 02/07/2024 (Shift-01)

(a) 15 liters (b) 12 liters
(c) 27 liters (d) 20 liters

9. There is a 32L mixture of milk and water. The ratio of milk and water in this mixture is 5 : 3. How many litres of water should be added to this mixture so that the resultant mixture has 50% water in it?

SSC CGL 23/09/2024 (Shift-01)

(a) 8 (b) 6
(c) 5 (d) 4

10. Half litre of a solution contains 15% alcohol. To change the alcohol concentration to 50%, find the quantity of alcohol to be mixed.

SSC CGL 26/09/2024 (Shift-02)

(a) 250 ml (b) 350 ml
(c) 175 ml (d) 400 ml

11. A vessel contains liquid A and liquid B in the ratio 4 : 9. If 8 litres of liquid A is added to the vessel, the new ratio becomes 8 : 9. Find the quantity of liquid A (in litres) in the original mixture.

SSC MTS 04/09/2023 (Shift-02)

(a) 12 (b) 9
(c) 8 (d) 6

12. A mixture contains alcohol and water in the ratio of 12 : 5. On adding 14 liters of water, the ratio of alcohol to water becomes 4 : 3. The quantity of alcohol in the mixture is:

SSC CHSL 04/07/2024 (Shift-04)

(a) 18 liter (b) 30 liter
(c) 28 liter (d) 42 liter

13. A vessel contains 18 litres mixture of milk and water in the ratio 5: 1. If 3 litres of milk is added to the vessel, then how much water (in litres) should be added to the vessel to have milk and water in the ratio 9:2?

SSC CPO 28/06/2024 (Shift-03)

(a) 2 (b) 1.5
(c) 0.5 (d) 1

14. The quantity of milk in a mixture of milk and water is $\frac{4}{5}$ of the volume of the mixture. After adding 1 liter of milk to 5 liters of the mixture, the percentage of water in the mixture is:

SSC CPO 29/06/2024 (Shift-03)

(a) 17.5% (b) 15%
(c) $\frac{200}{6}$% (d) $\frac{100}{6}$%

15. In some quantity of water, four times the quantity of milk is added and the quantity of the mixture is now 7.5 litres. How much more milk is to be added to the mixture to have 90% milk in the mixture?

SSC MTS 11/09/2023 (Shift-01)

(a) 7.5 litres (b) 9.5 litres
(c) 6 litres (d) 9 litres

16. A drink is made by mixing water and juice in the ratio 9 : 7. If x litres of water and $2x$ litres of juice are mixed in 160 litres of drink, then the new ratio becomes 13 : 15. The quantity of drink (in litres) is:

SSC CPO 29/06/2024 (Shift-02)

(a) 240 (b) 280
(c) 300 (d) 260

17. An alloy contains 40% of silver, 30% of copper and 30% of nickel. How much silver (in kg) should be added to 25 kg of the alloy so that the new alloy contains 50% of silver?

SSC CGL 11/04/2022 (Shift-02)

(a) 5 (b) 10
(c) 12 (d) 20

18. In a solution of water and milk, the quantity of milk is double the quantity of water. To pass the quality standards, the solution must contain 90% milk in it. If the volume of the solution is V, then how much pure milk is to be added to the solution to pass the quality standard?

SSC CHSL 02/08/2023 (Shift-02)

(a) $\frac{4}{3}$V (b) $\frac{3}{4}$V
(c) $\frac{7}{4}$V (d) $\frac{7}{3}$V

◆ TYPE – II ◆ CONCEPT OF REPLACEMENT

19. A bottle is filled with liquid of which 4 parts are water and 5 parts are fruit extract. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half fruit extract?

SSC CHSL 03/08/2023 (Shift-03)

(a) $\frac{1}{10}$ (b) $\frac{9}{10}$
(c) $\frac{4}{9}$ (d) $\frac{5}{9}$

20. A vessel is filled with liquid, 5 parts of which are water and 11 parts syrup. What part of the mixture must be drawn off and replaced with water so that the mixture may have syrup and water in the ratio 3 : 2?

SSC CGL 26/07/2023 (Shift-01)

(a) $\frac{14}{45}$ (b) $\frac{27}{35}$
(c) $\frac{36}{65}$ (d) $\frac{7}{55}$

21. A container contains a mixture of two liquids, A and B, in the proportion 7 : 5. If 9 liters of the mixture is replaced by 9 liters of Liquid B, then the ratio of the two liquids becomes 7 : 9. How much of liquid A was there in the container initially?

SSC MTS 05/07/2022 (Shift-03)

(a) 21 liters (b) 35 liters
(c) 40 liters (d) 19 liters

22. A solution contains acid and water in the ratio of 4 : 5. If 20% of the solution is replaced by water, then what will be the ratio of acid and water in the new solution?

SSC CHSL 13/04/2020 (Shift-01)

(a) 10 : 7 (b) 5 : 17
(c) 16 : 29 (d) 8 : 15

23. A vessel contains some milk. 6 litre of the milk was taken out of the vessel and replaced with 6 litre of water and again 6 litre of mixture was taken out and was replaced with water. Now the ratio of milk to water become 100 : 69. Find the initial quantity of milk in the vessel.

SSC CHSL 09/08/2023 Shift-02

(a) 28 litre (b) 26 litre
(c) 36 litre (d) 46 litre

24. A vessel contained a solution of acid and water, in which water was 64%. Four litres of the solution was taken out of the vessel and the same quantity of water was added. If the resulting solution contains 30% acid, the quantity (in litres) of the water in the solution, at the beginning in the vessel, was:

SSC CGL TIER-II 03/02/2022

(a) 11.36 (b) 15.36
(c) 8.64 (d) 12.64

25. A vessel contains a solution of two liquids A and B in the ratio 5 : 3. When 10 litres of the solution is taken out and replaced by the same quantity of B, the ratio of A and B in the vessel becomes 10 : 11. The quantity (in litres) of the solution, in the vessel was ____.

SSC CGL TIER-II 16/11/2020

(a) 48 (b) 52
(c) 42 (d) 44

26. A vessel contains a 32 litre solution of acid and water in which the ratio of acid and water is 5: 3. If 12 litres of the solution are taken out and $7\frac{1}{2}$ litres of water are added to it, then what is the ratio of acid and water in the resulting solution?

SSC CGL TIER-II 13/09/2019

(a) 4 : 7 (b) 5 : 6
(c) 4 : 9 (d) 8 : 11

27. From a container having pure milk, 35% is replaced by water and the process is repeated thrice. At the end of the third operation, the purity of the milk is:

SSC MTS 01/09/2023 (Shift-03)

(a) $37\frac{21}{80}\%$ (b) $21\frac{33}{80}\%$
(c) $23\frac{37}{80}\%$ (d) $27\frac{37}{80}\%$

28. From a cask of milk containing 64 litres, 8 litres are drawn out and the cask is filled up with water. If the same process is repeated a second, then a third time, what will be the proportion of milk to water in the resulting mixture?

SSC CHSL 09/08/2023 Shift-02

(a) 343 : 179 (b) 333 : 169
(c) 443 : 179 (d) 343 : 169

29. A 10-litre solution of milk and water contains 8 litres of milk. 2 litres of the solution is replaced by pure milk and mixed. The process is repeated two more times. How much milk (in litres) is present in the mixture so obtained?

SSC CHSL 14/08/2023 (Shift-01)

(a) 8.976 (b) 8.597
(c) 8.796 (d) 8.679

◆ TYPE – III ◆

MIXING DIFFERENT MIXTURES TO FORM A SINGLE MIXTURE

30. A merchant mixes two varieties of sugar of 5 kg and 3 kg, which costs him Rs.4 and Rs.6 per kg, respectively. What is the cost price (in Rs.) of the mixture per kg?

SSC CGL 12/09/2024 (Shift-03)

(a) 4.35 (b) 4.45
(c) 4.75 (d) 4.21

31. A shopkeeper mixes two types of rice costing Rs. $\frac{250}{5}$ kg and Rs. $\frac{280}{5}$ kg in the ratio 7 : 8. Find the net cost of the resultant mixture (per kg).

SSC CGL 13/09/2024 (Shift-01)

(a) Rs.32.50 (b) Rs.53.20
(c) Rs.52.30 (d) Rs.25.30

32. 42 litres of milk at Rs.25 per litre is mixed with 28 litres of milk at Rs.40 per litre. Find the average price of the mixture?

SSC CGL 17/09/2024 (Shift-03)

(a) Rs.31.5 (b) Rs.32.5
(c) Rs.32 (d) Rs.31

33. 15 kg of Rs.10 per kg wheat is mixed with 5 kg of another type of wheat to get a mixture costing Rs.30 per kg. Find the price (per kg) of the costlier wheat.

SSC CGL 19/09/2024 (Shift-01)

(a) Rs.70 (b) Rs.80
(c) Rs.60 (d) Rs.90

34. Ratna buys 10 kg of rice for Rs.88 per kg and another 20 kg of rice for Rs.187 per kg. What is the per kg cost (in Rs.) ofthe total mixture of rice for her?

SSC CHSL 10/07/2024 (Shift-02)

(a) 150 (b) 154
(c) 158 (d) 148

35. A shopkeeper mixes 15 kg of sugar costing ₹11/kg with 22 kg of sugar costing ₹12/kg. What is the cost (in ?) per kg of the mixture? (Rounded off to 2 decimal places)

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 11.51 (b) 11.59
(c) 11.38 (d) 11.84

36. 2 varieties of tea powders worth Rs.250/kg and Rs.300/kg are mixed with a third variety of tea powder in the ratio 1 : 1 : 2. If the mixture is worth Rs.350/kg, find the price of the third variety tea powder.

SSC CGL 13/09/2024 (Shift-02)

(a) Rs.450/kg. (b) Rs.400/kg.
(c) Rs.425/kg. (d) Rs.500/kg.

37. Tea leaves worth ₹108 per kg and ₹120 per kg are mixed with a third variety in the ratio 2 : 3 : 5. If the mixture is worth ₹125 per kg, the price (in, rounded off to the nearest integer) of the third variety of tea leaves per kg will be:

SSC MTS 08/09/2023 (Shift-03

(a) 128 (b) 133
(c) 135 (d) 130

38. If one man adds 6 litres of water to 10 litres of milk and another man adds 4 litres of water to 8 litres of milk. Find the ratio of milk in the two mixtures.

SSC CGL 10/09/2024 (Shift-03)

(a) 16 : 15 (b) 12 : 11
(c) 16 : 17 (d) 15 : 16

39. Two different quantities of the same solution having ingredients A and B are stored in two different containers. In the first container, there are 252 litre of A and 441 litre of B. In the second container, the total quantity of the solution was 1188 litre. How much of the solution in the second container was made up of ingredient B?

SSC CGL 13/09/2024 (Shift-02)

(a) 765 ltr. (b) 756 ltr.
(c) 752 ltr. (d) 760 ltr.

40. Ramu mixes 2 litres of water at 100° C and 18 litres of water at 32° C. What temperature will the water have after mixing?

SSC CHSL 08/07/2024 (Shift-03)

(a) 66°C (b) 20°C
(c) 38.8°C (d) 40°C

41. In alloys A and B, the ratio of lead to tin is 5 : 3 and 3 : 1, respectively. 80 kg of alloy A and 100 kg of alloy B are mixed together to form a new alloy. What is the amount of tin (in kg) in the new alloy?

SSC CPO 27/06/2024 (Shift-03)

(a) 90 (b) 55
(c) 68 (d) 81.3

(a) $\frac{14}{45}$ (b) $\frac{27}{35}$

(c) $\frac{36}{65}$ (d) $\frac{7}{55}$

21. A container contains a mixture of two liquids, A and B, in the proportion 7 : 5. If 9 liters of the mixture is replaced by 9 liters of Liquid B, then the ratio of the two liquids becomes 7 : 9. How much of liquid A was there in the container initially?

SSC MTS 05/07/2022 (Shift-03)

(a) 21 liters (b) 35 liters

(c) 40 liters (d) 19 liters

22. A solution contains acid and water in the ratio of 4 : 5. If 20% of the solution is replaced by water, then what will be the ratio of acid and water in the new solution?

SSC CHSL 13/04/2020 (Shift-01)

(a) 10 : 7 (b) 5 : 17

(c) 16 : 29 (d) 8 : 15

23. A vessel contains some milk. 6 litre of the milk was taken out of the vessel and replaced with 6 litre of water and again 6 litre of mixture was taken out and was replaced with water. Now the ratio of milk to water become 100 : 69. Find the initial quantity of milk in the vessel.

SSC CHSL 09/08/2023 Shift-02

(a) 28 litre (b) 26 litre

(c) 36 litre (d) 46 litre

24. A vessel contained a solution of acid and water, in which water was 64%. Four litres of the solution was taken out of the vessel and the same quantity of water was added. If the resulting solution contains 30% acid, the quantity (in litres) of the water in the solution, at the beginning in the vessel, was:

SSC CGL TIER-II 03/02/2022

(a) 11.36 (b) 15.36

(c) 8.64 (d) 12.64

25. A vessel contains a solution of two liquids A and B in the ratio 5 : 3. When 10 litres of the solution is taken out and replaced by the same quantity of B, the ratio of A and B in the vessel becomes 10 : 11. The quantity (in litres) of the solution, in the vessel was ____.

SSC CGL TIER-II 16/11/2020

(a) 48 (b) 52

(c) 42 (d) 44

26. A vessel contains a 32 litre solution of acid and water in which the ratio of acid and water is 5: 3. If 12 litres of the solution are taken out and $7\frac{1}{2}$ litres of water are added to it, then what is the ratio of acid and water in the resulting solution?

SSC CGL TIER-II 13/09/2019

(a) 4 : 7 (b) 5 : 6

(c) 4 : 9 (d) 8 : 11

27. From a container having pure milk, 35% is replaced by water and the process is repeated thrice. At the end of the third operation, the purity of the milk is:

SSC MTS 01/09/2023 (Shift-03)

(a) $37\frac{21}{80}\%$ (b) $21\frac{33}{80}\%$

(c) $23\frac{37}{80}\%$ (d) $27\frac{37}{80}\%$

28. From a cask of milk containing 64 litres, 8 litres are drawn out and the cask is filled up with water. If the same process is repeated a second, then a third time, what will be the proportion of milk to water in the resulting mixture?

SSC CHSL 09/08/2023 Shift-02

(a) 343 : 179 (b) 333 : 169

(c) 443 : 179 (d) 343 : 169

29. A 10-litre solution of milk and water contains 8 litres of milk. 2 litres of the solution is replaced by pure milk and mixed. The process is repeated two more times. How much milk (in litres) is present in the mixture so obtained?

SSC CHSL 14/08/2023 (Shift-01)

(a) 8.976 (b) 8.597

(c) 8.796 (d) 8.679

◆ TYPE – III ◆

MIXING DIFFERENT MIXTURES TO FORM A SINGLE MIXTURE

30. A merchant mixes two varieties of sugar of 5 kg and 3 kg, which costs him Rs.4 and Rs.6 per kg, respectively. What is the cost price (in Rs.) of the mixture per kg?

SSC CGL 12/09/2024 (Shift-03)

(a) 4.35 (b) 4.45

(c) 4.75 (d) 4.21

31. A shopkeeper mixes two types of rice costing Rs. $\frac{250}{5}$ kg and Rs. $\frac{280}{5}$ kg in the ratio 7 : 8. Find the net cost of the resultant mixture (per kg).

SSC CGL 13/09/2024 (Shift-01)

(a) Rs.32.50 (b) Rs.53.20

(c) Rs.52.30 (d) Rs.25.30

32. 42 litres of milk at Rs.25 per litre is mixed with 28 litres of milk at Rs.40 per litre. Find the average price of the mixture?

SSC CGL 17/09/2024 (Shift-03)

(a) Rs.31.5 (b) Rs.32.5

(c) Rs.32 (d) Rs.31

33. 15 kg of Rs.10 per kg wheat is mixed with 5 kg of another type of wheat to get a mixture costing Rs.30 per kg. Find the price (per kg) of the costlier wheat.

SSC CGL 19/09/2024 (Shift-01)

(a) Rs.70 (b) Rs.80

(c) Rs.60 (d) Rs.90

34. Ratna buys 10 kg of rice for Rs.88 per kg and another 20 kg of rice for Rs.187 per kg. What is the per kg cost (in Rs.) ofthe total mixture of rice for her?

SSC CHSL 10/07/2024 (Shift-02)

(a) 150 (b) 154

(c) 158 (d) 148

35. A shopkeeper mixes 15 kg of sugar costing ₹11/kg with 22 kg of sugar costing ₹12/kg. What is the cost (in ?) per kg of the mixture? (Rounded off to 2 decimal places)

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 11.51 (b) 11.59

(c) 11.38 (d) 11.84

36. 2 varieties of tea powders worth Rs.250/kg and Rs.300/kg are mixed with a third variety of tea powder in the ratio 1 : 1 : 2. If the mixture is worth Rs.350/kg, find the price of the third variety tea powder.

SSC CGL 13/09/2024 (Shift-02)

(a) Rs.450/kg. (b) Rs.400/kg.

(c) Rs.425/kg. (d) Rs.500/kg.

37. Tea leaves worth ₹108 per kg and ₹120 per kg are mixed with a third variety in the ratio 2 : 3 : 5. If the mixture is worth ₹125 per kg, the price (in, rounded off to the nearest integer) of the third variety of tea leaves per kg will be:

SSC MTS 08/09/2023 (Shift-03

(a) 128 (b) 133

(c) 135 (d) 130

38. If one man adds 6 litres of water to 10 litres of milk and another man adds 4 litres of water to 8 litres of milk. Find the ratio of milk in the two mixtures.

SSC CGL 10/09/2024 (Shift-03)

(a) 16 : 15 (b) 12 : 11

(c) 16 : 17 (d) 15 : 16

39. Two different quantities of the same solution having ingredients A and B are stored in two different containers. In the first container, there are 252 litre of A and 441 litre of B. In the second container, the total quantity of the solution was 1188 litre. How much of the solution in the second container was made up of ingredient B?

SSC CGL 13/09/2024 (Shift-02)

(a) 765 ltr. (b) 756 ltr.

(c) 752 ltr. (d) 760 ltr.

40. Ramu mixes 2 litres of water at 100° C and 18 litres of water at 32° C. What temperature will the water have after mixing?

SSC CHSL 08/07/2024 (Shift-03)

(a) 66°C (b) 20°C

(c) 38.8°C (d) 40°C

41. In alloys A and B, the ratio of lead to tin is 5 : 3 and 3 : 1, respectively. 80 kg of alloy A and 100 kg of alloy B are mixed together to form a new alloy. What is the amount of tin (in kg) in the new alloy?

SSC CPO 27/06/2024 (Shift-03)

(a) 90 (b) 55

(c) 68 (d) 81.3

42. In two alloys, the ratio of aluminum and zinc are 5:6 and 3:5. If 242 kg of the first alloy and 144 kg of the second alloy are mixed, then ratio of aluminum and zinc in the new alloy will be:

SSC CHSL 07/08/2023 (Shift-04)

(a) 76:117 (b) 82:111
(c) 93:100 (d) 68:125

43. One cup has juice and water in the ratio 5 : 2, while another cup of the same capacity has them in the ratio 7: 4, respectively. If contents of both the cups (when full) are poured in a vessel, then what will be the final ratio of water to juice in the vessel?

SSC CGL TIER-II 29/01/2022

(a) 52 : 25 (b) 25 : 26
(c) 26 : 25 (d) 25 : 52

44. Two vessels of equal capacity contain juice and water in the ratio of 3 : 5 and 3 : 1 respectively. The mixture of both the vessels are mixed and transferred into a bigger vessel. What is the ratio of juice and water in the new mixture?

SSC CHSL 21/03/2023 (Shift-04)

(a) 13 : 9 (b) 9 : 7
(c) 8 : 9 (d) 7 : 3

45. Two containers of equal capacity are full of mixture of milk and water. In the first, the ratio of milk to water is 3 : 7 and in the second it is 7 : 9. Now both the mixtures are mixed in a bigger container. What is the resulting ratio of milk to water?

SSC Phase-XII 24/06/2024 (Shift-01)

(a) 59 : 101 (b) 57 : 107
(c) 61 : 97 (d) 58 : 103

46. Two containers of equal capacity are full of a mixture of milk and water. In the first container, the ratio of milk to water is 3 : 11 and in the second container the ratio is 9 : 11. If both the mixtures are mixed in a container, what is the resulting ratio of milk to water?

SSC MTS 06/09/2023 (Shift-02)

(a) 93 : 187 (b) 21 : 87
(c) 93 : 179 (d) 87 : 197

47. The compositions of two mixtures A and B are as follows: The ratio of copper and tin in mixture A is 1 : 2. The ratio of copper and tin in mixture B is 1 : 3. If mixture C is made by using equal quantities of mixture A and B, then find the ratio of copper and tin in mixture C.

SSC CPO 04/10/2023 (Shift-03)

(a) 2 : 5 (b) 7 : 17
(c) 7 : 12 (d) 1 : 5

48. Alloy A contain metals x and y in the ratio 5 : 2 and alloy B contains these metals in the ratio 3 : 4. Alloy C is prepared by mixing A and B in the ratio 4 : 5. The percentage of y in alloy C is:

SSC CGL TIER-II 29/01/2022

(a) $44\frac{4}{9}\%$ (b) $33\frac{4}{9}\%$
(c) $66\frac{4}{9}\%$ (d) $55\frac{4}{9}\%$

49. Two jars A and B are containing the solutions of two liquids P and Q. The ratio of the liquids P and Q in the jars A and B are 2 : 19 and 1 : 11, respectively. If 7 litres of the solution of jar A and 4 litres of the solution of jar B are mixed, what is the ratio of the solutions P and Q in the new mixture.

SSC CHSL 11/08/2023 (Shift-04)

(a) 10 : 1 (b) 1 : 9
(c) 9 : 1 (d) 1 : 10

50. A mango juice is made by mixing water and mango concentrate in the ratio 9 : 7. If x litres of water and $3x$ litres of mango concentrate is mixed in 160 litres of mango juice, then the new ratio becomes 13 : 14. What is the quantity of the new mango juice (in litres)?

SSC CGL 23/09/2024 (Shift-02)

(a) 197 litre (b) 212 litre
(c) 206 litre (d) 216 litre

51. In vessels X and Y, the ratio of acid and water are 3 : 7 and 1 : 3, respectively. The contents of X and Y are mixed in the ratio of 1 : 2 to get a solution in which acid and water are in the ratio a : b. What is the value of $\frac{b+a}{b-a}$?

SSC Selection Post Phase-IX 2022

(a) $\frac{15}{7}$ (b) $\frac{11}{7}$
(c) $\frac{13}{7}$ (d) $\frac{12}{7}$

52. Vessel A contains milk and water in the ratio 4: 5. Vessel B contains milk and water in the ratio 2 : 1. If x litres mixture of A is mixed with y litres mixture of B, then the ratio of milk to water in the mixture becomes 8 : 5. Find the ratio x : y.

SSC CGL TIER-II (18/01/2025)

(a) 3 : 10 (b) 5 : 6
(c) 2 : 5 (d) 3 : 4

53. The ratio of copper and Zinc in alloy A is 5 : 7 and that in alloy B is 4 : 5. A and B are taken in the ratio of 1 : 2 and mixed to form a new alloy C. What part of C is copper?

SSC MTS 08/10/2021 (Shift-01)

(a) $\frac{5}{12}$ (b) $\frac{61}{108}$
(c) $\frac{4}{9}$ (d) $\frac{47}{108}$

54. A and B are solutions of acid and water. The ratios of water and acid in A and B are 4 : 5 and 1 : 2, respectively. If x litres of A is mixed with y litres of B, then the ratio of water and acid in the mixture becomes 8 : 13. What is x : y?

SSC CGL TIER-II 15/11/2020

(a) 5 : 6 (b) 2 : 5
(c) 3 : 4 (d) 2 : 3

55. If 36 liters of solution containing 20% milk is added to 48 liters of solution containing 10% milk, what will be the percentage of milk in the resulting solution?

Selection post 27/06/2023 (Shift-03)

(a) 14.28% (b) 15.48%
(c) 14.38% (d) 13.36%

56. One liquid contains 20% of acid the other liquid contain 30% of acid. A can is filled with 7 parts of the first liquid and 3 parts of the second liquid. The percentage of the acid in the new mixture is:

SSC MTS 15/06/2023 (Shift-01)

(a) 13% (b) 30%
(c) 14% (d) 23%

57. 40 litres of 60% concentration of acid solution is added to 35 litres of 80% concentration of acid solution. What is the concentration of acid in the new solution?

SSC CGL Tier-II 12/09/2019

(a) 66% (b) $66\frac{2}{3}\%$
(c) $69\frac{1}{3}\%$ (d) 69%

58. Three bottles of the same capacity are 30%, 40% and 25% full of orange juice, respectively. They are filled up completely by adding apple juice. The contents of the three bottles are emptied into another vessel. What is the percentage of apple juice in the mixture?

SSC Selection Post Phase-IX 2022

(a) 65% (b) $68\frac{1}{3}\%$
(c) $51\frac{2}{3}\%$ (d) 72%

59. Alloy A contains metals x and y only in the ratio 5 : 2, while alloy B contains them in the ratio 3 : 4 Alloy C is prepared by mixing alloys A and B in the ratio 4 : 5. The percentage of x in alloy C is:

SSC CGL TIER-II 29/01/2022

(a) $55\frac{2}{9}\%$ (b) $55\frac{1}{9}\%$
(c) $55\frac{4}{9}\%$ (d) $55\frac{5}{9}\%$

60. Alloy A contains copper and zinc in the ratio of 4 : 3 and alloy B contains copper and zinc in the ratio of 5 : 2. A and B are taken in the ratio of 5 : 6 and melted to form a new alloy. The percentage of zinc in the new alloy is closest to:

SSC CGL TIER-II 12/09/2019

(a) 54 (b) 34.2
(c) 36.8 (d) 35

61. An alloy contains the metals A, B and C in the ratio 2 : 3 : 1 and another contains the metals B, C and D in the ratio 5 : 4 : 3. If equal weights of both alloys are mixed together to form a third alloy, then how much part of the metal B is in new alloy?

SSC CPO 29/06/2024 (Shift-03)

(a) $\frac{1}{8}$ (b) $\frac{1}{6}$

(c) $\frac{3}{24}$ (d) $\frac{11}{24}$

62. There are three cups of mixture of milk and water in ratio 4 : 5, 5 : 6, 9: 7.36 liters of first and 44 liters of second cup are taken. How much quantity from third cup is to be taken so that final mixture from the three cups will have milk and water in ratio 1 : 1?

SSC MTS 10/05/2023 (Shift-02)

(a) 32 litres (b) 64 litres

(c) 54 litres (d) 60 litres

◆ TYPE – IV ◆
BASED ON ALLIGATION

63. If two varieties of a grain worth ₹202 per kg and ₹250 per kg, respectively, are mixed in the ratio of 7 : 5, then what is the cost (in ₹) of the resulting mixture per kg?

SSCMTS 05/09/2023 (Shift-01)

(a) 218 (b) 220

(c) 222 (d) 225

64. A man buys 10 kg of wheat at a rate of Rs.26/kg. The wheat is mixed with 6 kg of other good quality of wheat to get a mixture at a price of Rs.35/ kg. The price of good quality wheat per kg (in Rs.) is:

SSC CGL 24/09/2024 (Shift-02)

(a) 38 (b) 42

(c) 50 (d) 46

65. How much rice of Rs.4/kg should be mixed to 15 kg of rice of Rs.10/kg, so as to make a mixture worth Rs.6.50/kg?

SSC CGL 26/09/2024 (Shift-03)

(a) 15 kg (b) 21 kg

(c) 30 kg (d) 40 kg

66. In what ratio must a grocer mix two varieties of pulses costing ₹60 and ₹75 per kg, respectively, so as to get a mixture worth ₹65 per kg?

SSC CHSL 01/07/2024 (Shift-03)

(a) 3 : 4 (b) 1 : 2

(c) 2 : 3 (d) 2 : 1

67. 5 kg of ₹18 per kg wheat is mixed with 2 kg of another type of wheat to get a mixture costing ₹20 per kg. Find the price (per kg) of the costlier wheat.

SSC CHSL 24/05/2022 (Shift- 03)

(a) ₹27 (b) ₹25

(c) ₹29 (d) ₹30

68. Rice worth ₹126 per kg and ₹135 kg are mixed with a third variety in the ratio of 1 : 1 : 2. If the mixture is worth ₹153 per kg, then price of the third variety per kg (in ₹)

SSC CGL 21/07/2023 (Shift-02)

(a) 182.5

(b) 195.5

(c) 175.5

(d) 133.5

69. A 100 ml solution of H_2SO_4 having concentration of 20% is mixed with a 50% concentrated x ml mixture such that the net mixture is 30% concentrated. Determine x.

SSC CGL 08/12/2022 (Shift-01)

(a) 70 ml (b) 80 ml

(c) 60 ml (d) 50 ml

70. 80% and 90% pure acid solutions are mixed to obtain 20 litres of 87% pure acid solution. Find the quantity (in litres) of 80% pure acid solution taken to form the mixture.

SSC CGL 20/04/2022 (Shift-01)

(a) 6 (b) 9

(c) 4 (d) 8

71. A person mixes two liquids, x and y. One litre of x weighs approximately 900g. and one litre of y weighs approximately 750 g. If one litre of the mixture weighs approximately 800g. then the percentage of x in the mixture is:

SSC Phase-XII 25/06/2024 (Shift-04)

(a) $33\frac{1}{3}\%$ (b) $27\frac{1}{2}\%$

(c) 30% (d) 50%

72. A solution of 45% alcohol is mixed with a solution of 60% alcohol in the ratio of 2 : 3. In what ratio should the resultant solution be mixed with a 72% alcohol solution to get a 66% alcohol solution?

SSC MTS 07/07/2022 (Shift-01)

(a) 4 : 7 (b) 1 : 3

(c) 1 : 2 (d) 2 : 3

73. A chemistry laboratory requests for a 25% solution of ferrous sulphate. A supplier has 40 millilitres of 20% solution. How many millilitres of 40% solution should be added to make it a 25% solution (correct to two decimal places)?

SSC Phase-XII 20/06/2024 (Shift-01)

(a) 14.30 (b) 15.20

(c) 16.40 (d) 13.33

◆ TYPE – V ◆
BASED ON PROFIT/LOSS

74. A grocer purchased 50 kg of sugar at ₹40 per kg and mixed with 70 kg of sugar at ₹30 per kg. At what rate should he sell the mixture (per kg) to gain 20%?

SSC MTS 04/09/2023 (Shift-02)

(a) ₹41 (b) ₹35

(c) ₹20 (d) ₹60

75. In what ratio should sugar costing ₹40 per kg be mixed with sugar costing ₹48 per kg, so as to earn a profit of 20% by selling the mixture at ₹54 per kg?

SSC CGL Tier-II 16/11/2020

(a) 3 : 5 (b) 4 : 7

(c) 2 : 3 (d) 5 : 8

76. In what ratio, sugar costing Rs.78 per kg be mixed with sugar costing Rs.46 per kg such that by selling the mixture at Rs.75 per kg there is a gain of 20%?

SSC CGL 24/09/2024 (Shift-01)

(a) 33 : 37 (b) 31 : 29

(c) 37 : 31 (d) 33 : 31

77. In what proportion must tea worth Rs.27 and Rs.31 per kg be mixed so as to gain 25% by selling the mixture at Rs.36 per kg?

SSC CHSL 09/07/2024 (Shift-01)

(a) 3 : 7 (b) 2 : 11

(c) 11 : 9 (d) 9 : 11

78. How many kilograms of sugar at ₹3.80 per kg must be mixed with 60 kg of sugar at ₹4.60 per kg, so that by selling the mixture at ₹5.20 per kg there may be a gain of 30%?

SSC MTS 01/09/2023 (Shift-03)

(a) 120 kg (b) 160 kg

(c) 170 kg (d) 180 kg

79. A milk vendor mixes water with milk and by selling the mixture at the cost price he gains $16\frac{1}{4}\%$. Find the ratio of milk to water in the mixture.

SSC MTS 11/09/2023 (Shift-02)

(a) 13 : 80 (b) 80 : 13

(c) 40 : 7 (d) 7 : 40

80. Rini has mixed two colours 'C_1' and 'C_2' in the ratio 2 : 3. If the rate of the colour 'C_1' is ₹500 per unit and she is selling the mixture of the two colours at ₹650 per unit at breakeven price, then what is the rate (in ₹) per unit of the second colour, that is, 'C_2'?

SSC CGL 27/07/2023 (Shift-01)

(a) 750 (b) 725

(c) 760 (d) 765

81. A businessman bought two types of rice at the rate of ₹120/kg and ₹220/kg. How much rice (in kg) of the first type should be mixed with 72 kg of rice of the second type so that the resulting mixture can be sold at ₹280/kg to earn a profit of 40%?

Selection post 27/06/2023 (Shift-02)

(a) 20 (b) 22

(c) 15 (d) 18

82. A milk merchant buys 30 litres of milk at the rate of ₹50 per litre and mixes 20 litres of water in it (water is free of cost). If he sells this mixture at the rate of ₹48 per litre, then what is the profit percentage?

SSC CHSL 13/03/2023 (Shift-02)

(a) 50% (b) 60%

(c) 40% (d) 66.66%

83. How many kilogram of rice costing ₹60 per kg. must be mixed with 24 kg. of rice costing ₹42 per kg. so that there may be a gain of 12% by selling the mixture at ₹56 per kg.?

SSC CGL TIER- II 07/03/2023

(a) 22 kg. (b) 20 kg.

(c) 19.2 kg. (d) 21.2 kg.

(a) 4 : 5　(b) 6 : 3
(c) 5 : 4　(d) 3 : 6

• TYPE – VI •

MISCELLANEOUS QUESTIONS

84. The concentrations of three acids, A, B, and C, are specified as 20%, 30%, and 40%, respectively. They are blended in a ratio of 3 : 5 : a, yielding a solution with a concentration of 30%. What is the value of 'a ?

SSC CGL 10/09/2024 (Shift-02)

(a) 3　(b) 1
(c) 2　(d) 4

85. 80 litres of a mixture of spirit and water in the ratio 7 : 9 is present in a container A. 20 litres of the mixture is transferred to another container B. Then the container A is filled with 20 litres of water. Then 32 litres of the mixture is again transferred to container B. The ratio of water to spirit of the mixture in container B is equal to:

SSC CGL TIER-II 26/10/2023

(a) 87 : 41　(b) 131 : 77
(c) 77 : 131　(d) 41 : 87

86. A milk vendor has 2 vessels of milk and water. The first contains 80% milk and the rest is water. The second contains 50% milk. How much mixture (in L) should he mix from each of the vessels so as to get 9 litres of mixture such that the ratio of water to milk is 1 : 2? (Write your answer in the order of vessel 1 and vessel 2)

SSC MTS 13/09/2023 (Shift-01)

(a) 4 : 5　(b) 6 : 3
(c) 5 : 4　(d) 3 : 6

87. In an experiment, it was observed that metal A is 19 times heavier than water and metal B is 9 times heavier than water. In what ratio metal A and B mixed so that the mixture thus obtained be 15 times heavier than water?

SSC CHSL 11/08/2023 (Shift-03)

(a) 2 : 3　(b) 1 : 3
(c) 3 : 1　(d) 3 : 2

88. P and Q are two alloys of aluminum and copper. The ratios of aluminum and copper in P and Q are 5 : 11 and 3 : 5, respectively. If a third alloy is formed by mixing alloys P and Q in the ratio of 1 : 3, then aluminum is what percentage (rounded off to the nearest integer) of the copper in the third alloy?

SSC CGL 13/12/2022 (Shift-04)

(a) 63%　(b) 52%
(c) 48%　(d) 56%

89. Pomegranate juice contains 10% sugar solution and orange juice contains 30% sugar solution. What is the percentage of sugar solution in a mixture of two litres of pomegranate juice and three litres of orange juice?

SSC CHSL 11/07/2024 (Shift-02)

(a) 22%　(b) 25%
(c) 20%　(d) 40%

90. There are 160 multiple choice questions in a test. 4 marks are allotted for correct answer and 1 mark is deducted for a wrong answer or un-attempted question from the total score of correct answers. If a candidate scored 400 marks in the test, how many question did he answer correctly ?

SSC CHSL 03/07/2024 (Shift-04)

(a) 110　(b) 115
(c) 112　(d) 120

91. The cost of 3 kg of rice is ₹180. The cost of 8 kg of rice is equal to that of 5 kg of pulse. The cost of 15 kg of pulses is equal to that of 2 kg of tea. The cost of 3 kg of tea is equal to that of 6 kg of walnuts. What is the cost (in ₹) of 10 kg of walnuts?

SSC CGL TIER-II 03/03/2023

(a) 2400　(b) 3200
(c) 2800　(d) 3600

92. Two mixtures A and B have the following compositions: Mixture A has copper and tin in a ratio of 1 : 2 Mixture B has copper and tin in a ratio of 1 : 3 If equal quantities of mixtures A and B are used for producing mixture C then find the ratio of copper and tin in mixture

SSC CPO 04/10/2023 (Shift-03)

(a) 2 : 5　(b) 7 : 17
(c) 7 : 12　(d) 1 : 5

ANSWER KEY

1.	(a)	2.	(a)	3.	(c)	4.	(b)	5.	(d)	6.	(a)	7.	(a)	8.	(a)	9.	(a)	10.	(b)
11.	(c)	12.	(d)	13.	(d)	14.	(d)	15.	(a)	16.	(b)	17.	(a)	18.	(d)	19.	(a)	20.	(d)
21.	(a)	22.	(c)	23.	(b)	24.	(b)	25.	(c)	26.	(b)	27.	(d)	28.	(d)	29.	(a)	30.	(c)
31.	(b)	32.	(d)	33.	(d)	34.	(b)	35.	(b)	36.	(c)	37.	(c)	38.	(d)	39.	(b)	40.	(c)
41.	(b)	42.	(b)	43.	(d)	44.	(b)	45.	(a)	46.	(a)	47.	(b)	48.	(a)	49.	(d)	50.	(d)
51.	(a)	52.	(a)	53.	(d)	54.	(c)	55.	(a)	56.	(d)	57.	(c)	58.	(b)	59.	(d)	60.	(d)
61.	(d)	62.	(b)	63.	(c)	64.	(c)	65.	(b)	66.	(d)	67.	(b)	68.	(c)	69.	(d)	70.	(a)
71.	(a)	72.	(c)	73.	(d)	74.	(a)	75.	(a)	76.	(d)	77.	(c)	78.	(d)	79.	(b)	80.	(a)
81.	(d)	82.	(b)	83.	(c)	84.	(a)	85.	(b)	86.	(c)	87.	(d)	88.	(d)	89.	(a)	90.	(c)
91.	(d)	92.	(b)																

SPEED BOOSTER HACKS

♦ Square Root of Non-perfect square ♦

$$\sqrt{N} = \sqrt{(A \pm B)} = \sqrt{A} \pm \frac{B}{2\sqrt{A}}$$

(First find a number which is perfect square near to the number N)

Ex: $\sqrt{10} = \sqrt{9+1} = \sqrt{9} + \frac{1}{2\sqrt{9}} = 3 + \frac{1}{2 \times 3} = \frac{19}{6} = 3.17$

Ex: $\sqrt{14} = \sqrt{16-2} = \sqrt{16} - \frac{2}{2\sqrt{16}} = 4 - \frac{2}{2 \times 4} = \frac{30}{8} = 3.75$

♦ Do it Yourself ♦

(i) $\sqrt{18}$ = ...

(ii) $\sqrt{29}$ = ...

(iii) $\sqrt{57}$ = ...

(iv) $\sqrt{265}$ = ...

(v) $\sqrt{567}$ = ...

SOLUTIONS

1. (a) Milk : Water

9 : 7

Diff.

$2\times$ 2 unit → 4 liter

1 unit → 2 liter

18 liter

2. (a) $40\% = \frac{2 \rightarrow \text{Milk}}{5 \rightarrow \text{Mixture}}$,

$60\% = \frac{3 \rightarrow \text{Milk}}{5 \rightarrow \text{Mixture}}$

M : W

$2_{\times2}$: $3_{\times2}$

$3_{\times3}$: $2_{\times3}$

4 : 6 = 10 unit $\xrightarrow{\times6}$ 60 liter

9 : 6

5 unit → 6 × 5 = 30 liter

Alternate Method:

Milk 40%   Milk 100%

60%

40 : 20

2 : 1

×30   ×30

60   30 litre

3. (c) $10\% = \frac{1}{10}$, $12\frac{1}{2}\% = \frac{1}{8}$

Wine : Water

63 : 7

$9_{\times7}$: $1_{\times7}$ = 70 → 70 unit → 70 liter

diff. → 2 unit → 2 liter

$7_{\times9}$: $1_{\times9}$ = 72

Alternate Method:

10%   100%

$12\frac{1}{2}\%$

87.5 : 2.5

35 : 1

×2   ×2

70   2 litre

4. (b) Given, tin = 25%
Then, Copper = 100% – 25% = 75%
Required amount of tin = 70%
Then, Copper = 100% – 70% = 30%
It is clear that,

$\text{Copper} \propto \frac{1}{\text{tin}}$

Initial   Final

Copper → 75 : 30

5 : 2

Tin → 2 : 5

375× ↓   +3 $\xrightarrow[\times375]{}$ $\boxed{1125\text{ kg}}$

750 kg

Alternate Method:

Let the added quantity of tin 100%

Tin 25%   Tin 100%

70%

30   45

Amount → 2 : 3

×375   ×375

750     $\boxed{1125}$

5. (d) Total mixture = 25 liter

M : W

Initial → 3 : 2 = 5 unit $\xrightarrow{\times5}$ 25

Final → $1_{\times3}$: $1_{\times3}$ 1 unit → 5 liter

3 : 3 = 6 unit

In the given mixture only water added. So, milk in the given mixture is constant

Hence, 5 litre water should be added in the resultant mixture.

Alternate Method:

Percentage of water in given mixture

$= \frac{2}{2+3} \times 100 = 40\%$

Water 40%   Water 100%

50%

50 : 10

5 : 1

×5   ×5

25   5 litre

6. (a) ∴ Amount of acid remain same.

Acid : Water

Initial → 3 : 7

Final → $1_{\times3}$: $4_{\times3}$ 5 unit

3 : 12

10 unit = 12 ltr.

(water) 5 unit → $\frac{12}{10} \times 5$ = 6 liters.

Alternate Method:

Acid in solution 30%   Acid in water 0%

20%

Amount → 20   10

2 : 1

×6   ×6

12 liters $\boxed{6\text{ liters}}$

7. (a) Initially, milk solution has 37% of water

Let x ltr. of milk is added

ATQ,

$\frac{37}{100} \times 49 = \frac{30}{100} \times (49 + x)$

$\Rightarrow x = \frac{343}{30} = 11\frac{13}{30}$

Alternate Method:

63%   100%

70%

30   7

49     $\frac{343}{30}$ lt.

Add Milk $= \frac{343}{30} = 11\frac{13}{30}$ litre

8. (a)

Milk	Mixture
∵ Rs.1 → $\frac{3}{2}$ ltr.	∵ Rs.1 → $\frac{15}{8}$ ltr.
∴ 1 ltr. → Rs. $\frac{2}{3}$	∴ 1 ltr. → Rs. $\frac{8}{15}$

Milk : Water

Price → $\frac{2}{3}$ 0

$\frac{8}{15}$

Quanitity → $\frac{8}{15}$: $\frac{2}{15}$

4 : 1

×15   ×15

60 : 15

9. (a) M   W

5 : 3

(1 $1)_{\times5}$ 2 unit

5 : 5

ATQ,

(5 + 3 = 8) unit = 32 ltr.

1 unit = 4

2 unit = 8 ltr.

Hence, 8 ltr. of water should be added.

Alternate method:

Since, milk quantity is same:-

$\frac{5}{8} \times 32 = \frac{1}{2} \times (32 + x)$

$\Rightarrow 40 = 32 + x$

$\Rightarrow x = 8$ ltr.

10. (b) $15\% = \frac{3}{20}$

Quantity of solution $= \frac{1}{2}$ litre

$50\% = \frac{1}{2}$

A   W

I → 3   17 = 20

+14

II → 17   17 = 34

∵ 20 unit → 500 ml

∴ 14 unit → $\frac{500}{20} \times 14$

= 25 × 14 = 350 ml

Alternate Method:-

$\text{Alcohol} \propto \frac{1}{\text{Water}}$

85 : 50

10 : 17

×50 ↓ 7 → 350

500

11. (c) A : B

4 unit (4 : 9

+8

→ 8 : 9

4 unit = 8 ltr.

Initial quantity of liquid A = 8 ltr.

12. (d) Alcohol : Water

$(12 : 5)_{\times 1} \rightarrow 12 : 5$ } 4 unit

$(4 : 3)_{\times 3} \rightarrow 12 : 9$

4 unit = 14 liter

12 unit = 42 liter

Alcohol in mixture = 42 litre

13. (d) 5 : 1 → 6 unit = 18 lt.

1 unit = 3 lt.

M W

15 : 3 } 1 liters

3

×2 (18 : $\boxed{4}$) ×2

9 : 2

1 litre water added

Alternate Method:

Given,

Milk Water

5 : 1 ⇒ 18 Ltr.

⇒ 15 : 3

ATQ,

$\frac{15+3}{3+x} = \frac{9}{2}$

$\Rightarrow 36 = 27 + 9x \Rightarrow x = 1$ Ltr.

14. (d) Milk : Water

4 : 1 → 5 liter

Add 1 liter extra milk

5 : 1 → 6 liter

Water % = $\frac{1}{6} \times 100 = \frac{100}{6}$ %

15. (a) M : W

(4 : 1 = 5 unit → 7.5 litre

+x

→ 9 : 1

5 unit = 7.5 litre

∴ x = 7.5 litre

Alternate Method:

M : W

5 (4 : 1 = 5 unit = 7.5

9 : 1

↓

7.5 litre

16. (b) Water : Juice : Total

9 : 7 : 16

↓×10 ↓×10 ↓×10

Qty → 90ltr 70ltr 160ltr

W J

90 : 70

1 : 2

13 : 15

11 unit → 110

1 unit → 10

∴ Quantity of drink = (13 + 15) = 28 unit = 28 × 10 = 280 litre

17. (a)

Silver Copper Nickel

Ratio→ 4 : 3 : 3 = $10 \xrightarrow{\times 2.5} 25$ kg

↓×2.5 ↓×2.5 ↓×2.5

Quantity→ 10 kg 7.5 kg 7.5 kg

Let x kg. silver should be added

$\therefore \frac{10+x}{25+x} = \frac{1}{2} \Rightarrow x = 5$ kg.

18. (d) Milk Water

+7 (2 : 1

→ 9 : 1

(3) unit → V

(1) unit → $\frac{V}{3}$

Milk added (7) unit = $\frac{7}{3}$V

19. (a) W : F

(4 : 5 = 9

(1) diff. $1_{\times 5}$: $1_{\times 5}$

= 5 : 5 = 10

Replaced value = $\frac{1}{10}$

Alternate Method:

Here mixture is replaced with water

ATQ,

$\left(\frac{5}{9}\right) \times K = \frac{1}{2} \Rightarrow K = \frac{9}{10}$

Replaced = $1 - \frac{9}{10} = \frac{1}{10}$

20. (d) Let k amount of mixture be replaced.

ATQ,

$\frac{11}{16} \times k = \frac{3}{5} \Rightarrow k = \frac{48}{55}$

Replaced With Water = $1 - \frac{48}{55} = \frac{7}{55}$

Alternate Method:

Water : Syrup Total

5 : 11 = 16 | × 5

2 : 3 = 5 | × 16

Water : Syrup

25 : $\boxed{55}$

32 : 48

Replaced with water = $\frac{7}{55}$

21. (a) Let k amount of mixture be replaced.

$\frac{7}{12} \times k = \frac{7}{16}$

$k = \frac{12}{16} = \frac{3}{4}$ 3 → Left, 4 → Original) 1 unit = 9 litre

Original Quantity = 4 × 9 = 36 litre

Quantity of liquid A initially

$= \frac{36}{12} \times 7 = 21$ litre

22. (c) 20% = $\frac{1}{5}$

Acid : Water Total

$4_{\times 10}$: $5_{\times 10}$ = $9_{\times 10}$

40 : 50 = 90

Let sol. = 90 lit

100% = 90 ⇒ 20% = 18 ltr

Now, sol = 72 lit

4 5

↓×8 ↓×8

32 40

+18 → water

32 : 58

16 : 29

23. (b) Milk (initial) : Milk (final)

169 : 100

$\sqrt{169}$: $\sqrt{100}$

13 10

3 unit = 6 litre

1 unit = 2 litre

Initial quantity of milk = 13 × 2 = 26 lit.

24. (b) ATQ,

$\frac{36}{100} \times k = \frac{30}{100}$

$k = \frac{5}{6}$ 5 → Left, 6 → Original) 1 unit = 4 litre

Original quantity = 6 × 4 = 24 ltr.

Required quantity of water =

$\frac{64}{100} \times 24 = 15.36$ ltr.

25. (c) Let k amount of mixture be replaced.

$\frac{5}{8} \times k = \frac{10}{21}$

$k = \frac{80}{105} = \frac{16}{21}$ 16 → Left, 21 → Original) 5 unit = 10 litre, 1 unit = 2 litre

Original Quantity = 2 × 21 = 42 litre

26. (b) 8 unit = 20

1 unit = $\frac{5}{2}$

Acid : Water

5 : 3

−12

$5 \times \frac{5}{2}$ $3 \times \frac{5}{2}$

20 litre → $\frac{25}{2}$: $\frac{15}{2}$

$+7\frac{1}{2}$

$\frac{25}{2}$: 15

5 : 6

27. (d) $\frac{\text{Milk}}{\text{Mixture}} = \left(1 - \frac{35}{100}\right)^3 = \frac{2197}{8000}$

% of pure milk in mixture

$= \frac{2197}{8000} \times 100\% = 27\frac{37}{80}\%$

Alternate Method:

Mixture : Milk

20 : 13

20 : 13

20 : 13

8000 : 2197

% of pure milk in mixture

$= \frac{2197}{8000} \times 100 = 27\frac{37}{80}\%$

28. (d) Remaining milk after third time

$= 64\left(1-\frac{8}{64}\right)^3 = 64\times\frac{7\times7\times7}{8\times8\times8}$

$= \frac{343}{8}$

Water $= 64-\frac{343}{8}=\frac{169}{8}$

Ratio of milk : water

$= \frac{343}{8}:\frac{169}{8} = 343 : 169$

Alternate Method:

Drawn out $= \frac{8}{64}=\frac{1}{8}$

Mixture	:	Milk
8	:	7
8	:	7
8	:	7
512	:	343

Water = 512 − 343 = 169

∴ Milk : Water = 343 : 169

29. (a) $\frac{\text{Remaining water}}{\text{initial water}}$

$= \left[1-\frac{\text{Mixture taken out}}{\text{Total mixture}}\right]^n$

$\frac{\text{Remaining water}}{\text{Initial water}} = \left(1-\frac{2}{10}\right)^3$

Remaining water $= 2\times\frac{4}{5}\times\frac{4}{5}\times\frac{4}{5}$

$= \frac{128}{125} = 1.024$

Remaining milk = 10 − 1.024

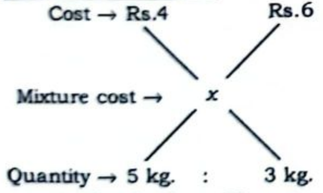
= 8.976 litre

30. (c) cost price of mixture

$= \frac{5\times4+3\times6}{5+3} = \frac{20+18}{8} = \frac{38}{8}$

= 4.75

Alternate Method:


Cost → Rs.4
Rs.6
Mixture cost →
x
Quantity → 5 kg.
:
3 kg.

$x = \frac{4\times5+6\times3}{5+3} = \frac{38}{8} = ₹4.75/kg.$

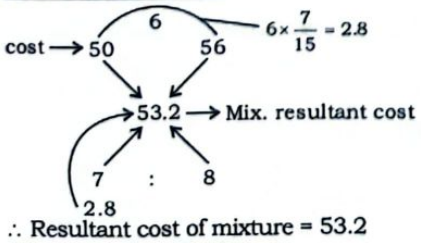
31. (b) Cost of resultant mixture

$= \frac{50\times7+56\times8}{15} = \frac{350+448}{15}$

$= \frac{798}{15} = 53.2$

Hence, resultant cost of mixture = 53.2

Alternate Method:-


6
cost → 50
56
$6\times\frac{7}{15}=2.8$
53.2 → Mix. resultant cost
7
:
8
2.8

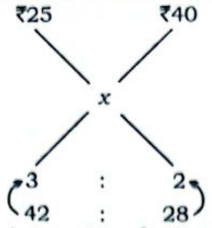
∴ Resultant cost of mixture = 53.2

32. (d) Avg. price of mixture

$= \frac{42\times25+28\times40}{42+28}$

$= \frac{1050+1120}{70} = \frac{2170}{70} = ₹31$

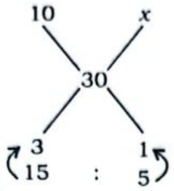
Alternate Method:


₹25
₹40
x
3
:
2
42
:
28

Avg. price of mixture (x)

$= \frac{3\times25+2\times40}{3+2} = \frac{75+80}{5} = ₹31$

33. (d)


10
x
30
3
:
1
15
:
5

ATQ,

$\frac{x-30}{20} = \frac{3}{1} \Rightarrow -30 + x = 60$

$\Rightarrow x = ₹90$

Alternate Method:

ATQ,

$(15 \times 10) + (5 \times x) = 30 \times 20$

$\Rightarrow 5x = 600 - 150$

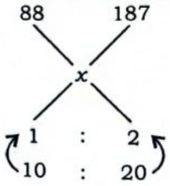
$\therefore x = \frac{450}{5} = ₹90$

34. (b) Per kg cost of total mixture

$= \frac{10\times88+20\times187}{10+20}$

$= \frac{880+3740}{30} = \frac{4620}{30} = 154$

Alternate Method:


88
187
x
1
:
2
10
:
20

$x = \frac{88\times1+187\times2}{3} = \frac{88+374}{3}$

$= \frac{462}{3} =$ Rs.154

35. (b) Total cost of 15 kg sugar

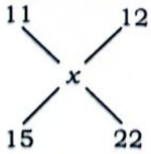
= 15 × 11 = ₹165

Total cost of 22 kg sugar = 22 × 12

= ₹264

Cost per kg $= \frac{165+264}{15+22} = \frac{429}{37} = ₹11.59$

Alternate Method:



$\Rightarrow \frac{12-x}{x-11} = \frac{15}{22}$

$\Rightarrow 264 - 22x = 15x - 165$

$\Rightarrow 37x = 429 \Rightarrow x = ₹11.59$

36. (c) Given,

	A	:	B	:	C
Ratio →	1		1		2
Price →	250		300		x

ATQ,

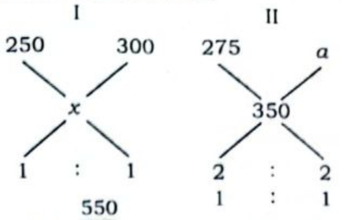
$(250 \times 1) + (300 \times 1) + 2x = 350 \times 4$

$\Rightarrow 250 + 300 + 2x = 1400$

$\Rightarrow 2x = 850$

$\Rightarrow x = 425$ Rs./kg

Alternate Method:


I
II
250
300
275
a
x
350
1
:
1
2
:
2
1
:
1

$x = \frac{550}{2}$ = ₹275/kg

$a = 75 + 350$ = ₹425/kg

37. (c) Let, third variety is x ₹/kg.

ATQ,

$(108 \times 2) + (120 \times 3) + (x \times 5) = 125 \times (2 + 3 + 5)$

$\Rightarrow 216 + 360 + 5x = 1250$

$\Rightarrow 5x = 674 \Rightarrow x = \frac{674}{5} \Rightarrow x = 134.80$

~ ₹135/kg.

Alternate Method:

Quantity → 2 : 3 : 5

Price → $\underbrace{108 : 120 : x}_{125}$

$x = 125 + \frac{(17\times2)+(5\times3)}{2+3}$

$= 125 + \frac{49}{5} = 125 + 9.8$

= 134.80 ~ 135

38. (d) Ratio of milk in two mixtures

$= \frac{10}{10+6} : \frac{8}{8+4} = \frac{10}{16} : \frac{8}{12}$

= 120 : 128 = 15 : 16

39. (b)

	A	:	B
I →	252	:	441
	4	:	7

ATQ,

(4 + 7) unit → 1188 ltr.

Total (11 unit) → 1188

B (7 unit) → $\frac{1188}{11} \times 7 = 108 \times 7$

= 756 ltr.

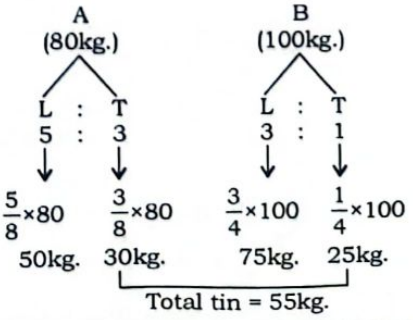
Note:- It can be done with the help of unit digit.

40. (c) Temperature of water after mixing

$= \frac{2\times100+18\times32}{2+18}$

$= \frac{776}{20} = 38.8$°C

41. (b)


A
(80kg.)
B
(100kg.)
L : T
5 : 3
L : T
3 : 1
$\frac{5}{8}\times80$
$\frac{3}{8}\times80$
$\frac{3}{4}\times100$
$\frac{1}{4}\times100$
50kg.
30kg.
75kg.
25kg.
Total tin = 55kg.

42. (b) Quantity of Aluminum in both alloys = $\frac{5}{11}\times 242+\frac{3}{8}\times 144$

$= 5 \times 22 + 3 \times 18$

$= 110 + 54 = 164$ kg

Quantity of Zinc in both alloys

$= (242 + 144) - 164$

$= 386 - 164 = 222$

Required ratio = 164 : 222 = 82 : 111

Alternate Method:

Al : Zinc

5 : 6 = 11 | × 8 × 242 = 11

3 : 5 = 8 | × 11 × 144 = 9

Al : Zinc

55 : 66

27 : 45

82 : 111

43. (d) Juice : Water

5 : 2 = 7 | ×11

7 : 4 = 11 | ×7

Juice : Water

55 : 22

49 : 28

104 : 50

52 : 25

Water : Juice = 25 : 52

44. (b) Juice : Water

3 : 5 = 8 |

3 : 1 = 4 | ×2

Juice : Water

3 : 5

6 : 2

9 : 7

45. (a) Milk : Water

$(3 : 7)_{\times 8}$

$(7 : 9)_{\times 5}$

24 : 56

35 : 45

59 : 101

46. (a) M : W Total

I^{st} C→ $3_{\times 10}$: $11_{\times 10}$ = $14_{\times 10}$

30 110 = 140

IInd C→ $9_{\times 7}$: $11_{\times 7}$ = $20_{\times 7}$

63 77 = 140

93 : 187

47. (b) By balancing the ratio that we have;

Copper : Tin

A → $1_{\times 4}$: $2_{\times 4}$ = $3)_{\times 4}$

4 : 8 = 12

B → $1_{\times 3}$: $3_{\times 3}$ = $4)_{\times 3}$ → Equal

3 : 9 = 12

C → 7 : 17

∴ Required ratio = 7 : 17

48. (a) x : y

5 : 2 = 7 | ×4

3 : 4 = 7 | ×5

x : y

20 : 8

15 : 20

35 : 28

5 : 4

Percentage of y = $\frac{4}{9}\times 100 = 44\frac{4}{9}\%$

49. (d) A B

P : Q P : Q

2 : 19 1 : 11

P in 7 litres of A = $7\times\frac{2}{21}=\frac{2}{3}$

Q in 7 litres of A = $7\times\frac{19}{21}=\frac{19}{3}$

P in 4 litres of B = $4\times\frac{1}{12}=\frac{1}{3}$

Q in 4 litres of B = $4\times\frac{11}{12}=\frac{11}{3}$

New mixture of P : Q

$=\left(\frac{2}{3}+\frac{1}{3}\right):\left(\frac{19}{3}+\frac{11}{3}\right) = 1 : 10$

Alternate Method:

P : Q

A → 2 : 19 = 21 = 7

B → 1 : 11 = 12 = 4

3 : 30

1 : 10

50. (d) Water = $\frac{9}{16}\times 160 = 90$ ltr.

Mango = 160 − 90 = 70 ltr.

ATQ,

$\frac{90+x}{70+3x}=\frac{13}{14}$

$\Rightarrow 1260 + 14x = 910 + 39x$

$\Rightarrow 350 = 25x$

$\Rightarrow x = 14$

New quantity of mango juice

$= 160 + x + 3x$

$= 160 + 4 \times 14 = 160 + 56 = 216$ ltr.

51. (a) Acid : Water

X → 3 : 7 = $10_{\times 2 \times 1}$

Y → 1 : 3 = $4_{\times 5 \times 2}$

3 : 7

5 : 15

8 : 22

a : b = 4 : 11

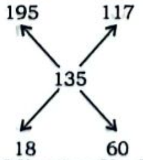
∴ $\frac{b+a}{b-a}=\frac{15}{7}$

52. (a)

Milk : Water = $(4 : 5 = 9)_{\times 39}$

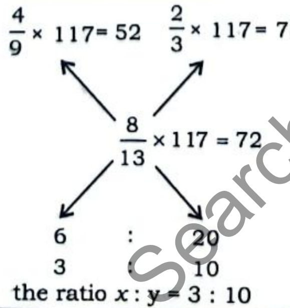
Milk : Water = $(2 : 1 = 3)_{\times 117}$

Milk : Water = $(8 : 5 = 13)_{\times 27}$



Mixutre X : Y = 3 : 10

Alternate Method:


$\frac{4}{9}\times 117 = 52$
$\frac{2}{3}\times 117 = 78$
$\frac{8}{13}\times 117 = 72$
6 : 20
3 : 10

the ratio x : y = 3 : 10

53. (d) Copper : Zinc

5 : 7 = 12 | ×3 ×1

4 : 5 = 9 | ×4 ×2

Copper : Zinc

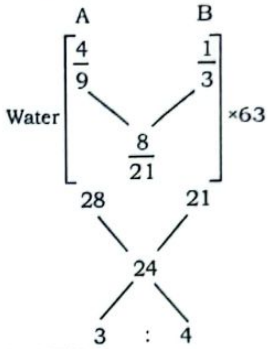
15 : 21

32 : 40

47 : 61

Copper in C = $\frac{47}{108}$

54. (c) L.C.M of 9, 3, 21 = 63



55. (a) ATQ,

Total amount of milk in final solution

$=\frac{36\times 20}{100}+\frac{48\times 10}{100} = 12$ liter

Total solution = 36 + 48 = 84 liter

Required% = $\frac{12}{84}\times 100 = 14.28\%$

Alternate Method:

36 lt. : 48 lt.

Mixture → 3 : 4

Milk → 20% : 10%

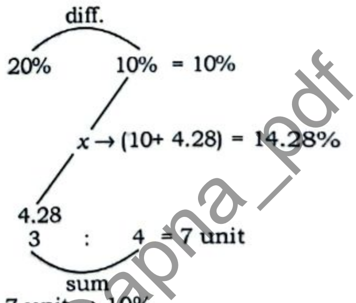
% of Milk = $\left(\frac{3\times 20+4\times 10}{7}\right)$

$=\frac{100}{7}\% = 14.28\%$

Alternate Method:

Solution ratio = 36 : 48

3 : 4



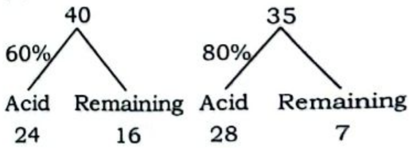
7 unit → 10%

3 unit → $\frac{10}{7}\times 3 = 4.28\%$

56. (d) Percentage of acid in new mixture

$=\frac{20\times 7+30\times 3}{10}=\frac{230}{10} = 23\%$

57. (c)



Acid : Remaining

24 + 28 : 16 + 7

52 : 23

%Concentration of acid

$$= \frac{52}{75} \times 100 = 69\frac{1}{3}\%$$

Alternate Method:

40 lt. : 35lt.

Mixture → 8 : 7

Acid → 60% : 80%

% Concentration of acid (x)

$$= \frac{8 \times 60 + 7 \times 80}{15}$$

$$= \frac{480 + 560}{15} = 69\frac{1}{3}\%$$

58. (b)

					Total
Bottle →	100	: 100	: 100	=	300
Apple Juice →	70	: 60	: 75	=	205

Overall the percentage of apple juice $= \frac{205}{300} \times 100 = 68\frac{1}{3}\%$

59. (d)

x : y
5 : 2 = 7 | ×4
3 : 4 = 7 | ×5
x : y
20 : 8
15 : 20
35 : 28
5 : 4

% of x in alloy C $= \frac{5}{9} \times 100 = 55\frac{5}{9}\%$

60. (d) Copper : Zinc
4 : 3 = 7 | ×5
5 : 2 = 7 | ×6
Copper : Zinc
20 : 15
30 : 12
50 : 27

$$\text{Zinc\%} = \frac{27}{50+27} \times 100$$

= 35.06% ~ 35%

61. (d)

A B C D
I^{st} Alloy → $(2 : 3 : 1)_{\times 2}$ = 6 unit$_{\times 2}$
IInd Alloy → (5 : 4 : 3) = 12 unit

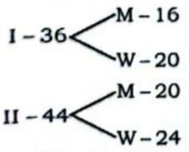
Now,

I^{st} Alloy → 4 : 6 : 2
IInd Alloy → 5 : 4 3
Mixture → 4 : 11 : 6 : 3

Metal B quantity in new alloy $= \frac{11}{24}$

62. (b)

	Milk	: Water
I	4	5
II	5	6
III	9	7



∵ Finally the ratio of milk and water is 1 : 1

Let, x ltr of III cup is taken:

Then, $36 + \left(\frac{x}{16} \times 9\right) = 44 + \left(\frac{x}{16} \times 7\right)$

$$\Rightarrow \frac{2}{16}x = 8 \Rightarrow x = 64 \text{ ltr.}$$

Alternate Method:

M : W
4 : 5 = 9 | 11 × 16 × 36 = 64
5 : 6 = 11 | 9 × 16 × 44 = 64
9 : 7 = 16 | 9 × 11 × x = x
1 : 1

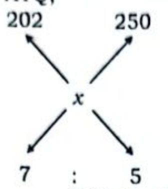
$$\frac{64 \times 4 + 64 \times 5 + 9x}{64 \times 5 + 64 \times 6 + 7x} = \frac{1}{1}$$

$\Rightarrow 576 + 9x = 704 + 7x$

$\Rightarrow 2x = 128 \Rightarrow x = 64$

63. (c) Let, the CP of resulting mixture = ₹x

ATQ,



$$\Rightarrow x = \frac{202 \times 7 + 250 \times 5}{7+5} = \frac{1414 + 1250}{12}$$

$$\Rightarrow x = \frac{2664}{12} = ₹222 \text{ kg.}$$

Alternate Method:

Quantity → 7 : 5

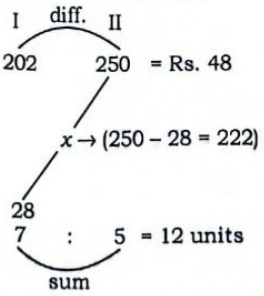
Price → $\boxed{202}$: 250

CP of resultant mixture

$$= 202 + \frac{(250 - 202) \times 5}{7+5}$$

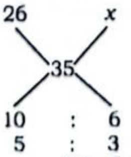
$$= 202 + \frac{48 \times 5}{12} = 202 + 20 = ₹222$$

Alternate Method:



$$12 \text{ unit} \rightarrow 48 \Rightarrow 7 \text{ unit} \rightarrow \frac{48}{12} \times 7 = 28$$

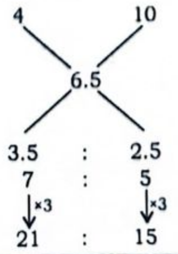
64. (c) Let price of 6 kg wheat per kg = x



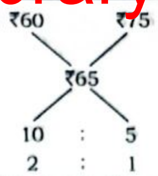
$$35 = \frac{26 \times 5 + 3 + x}{5+3}$$

$\Rightarrow 280 = 130 + 3x \Rightarrow x = 50$

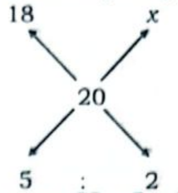
65. (b)



66. (d)



67. (b) Let x be the price of second type of wheat per kg.



$\Rightarrow x = 20 + 5 = 25$

68. (c) Let the price of the third variety of rice is ₹x/kg.

ATQ,

$$\frac{126 \times 1 + 135 \times 1 + x \times 2}{1+1+2} = 153$$

$\Rightarrow 126 + 135 + 2x = 612$

$\Rightarrow 2x = 612 - 261$

$$\Rightarrow x = \frac{351}{2} = 175.5$$

Alternate Method:

Quantity → 1 : 1 : 2

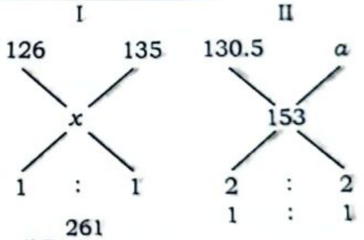
Price → $\underbrace{126 : 135 : x}_{153}$

Price of third variety (x)

$$= 153 + \frac{(153 - 126) + (153 - 135)}{2}$$

$$= 153 + \frac{27 + 18}{2} = 153 + 22.5 = 175.5$$

Alternate Method:



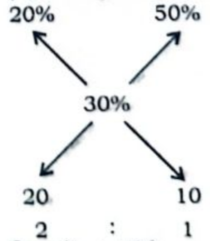
$$x = \frac{261}{2}$$

= ₹130.5/kg.

$a = 22.5 + 153$

= ₹175.5/kg.

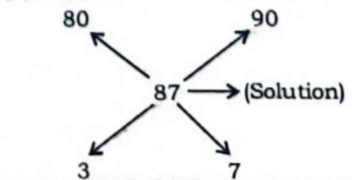
69. (d) Using alligation:



2 unit → 100

$$1 \text{ unit} \rightarrow \frac{100}{2} = 50 \text{ ml.}$$

70. (a) Acid A Acid B



∴ Acid with 80% concentration

$$= \frac{3}{10} \times 20 = 6 \text{ litre.}$$

71. (a) x y

900 750

800

50 100

Total mix = 100 + 50 = 150

Percentage of $x = \frac{50}{150} \times 100 = 33\frac{1}{3}\%$

72. (c) 45% 60%

x%

2 3

ATQ,

$\Rightarrow x = \frac{45 \times 2 + 60 \times 3}{5} \Rightarrow x = 54\%$

54% 72%

66%

6 12

$\boxed{1 : 2}$

73. (d) Let, the amount of 40% to be added = x

Total solution = $(40 + x)$

Amount of ferrous sulphate in the 20% solution

= 20% × 40 = 8 mililitres

Amount of ferrous sulphate in the 40% solution = 40% × x = $0.40x$ mililitres

Total amount of ferrous sulphate in the final solution = $0.25 \times (40 + x)$

ATQ,

$8 + 0.40x = 0.25 \times (40 + x)$

$\Rightarrow 8 + 0.40x = 10 + 0.25x \Rightarrow 0.15x = 2$

$x = \frac{2}{0.15} = \frac{200}{15} = \frac{40}{3} = 13.33$

Alternate Method:

20% 40%

25%

15% : 5%

3 : 1

40 : $\frac{40}{3}$ = 13.33

74. (a) ATQ,

50kg. : 70kg.

Quantity → 5 : 7

Price → ₹40 : ₹30

$\text{Average} = \frac{5 \times 40 + 7 \times 30}{5+7} = \frac{410}{12}$

Average per kg. at 20% profit

$= \frac{410}{12} \times \frac{120}{100} = 41$

75. (a) CP of mixture = $54 \times \frac{5}{6}$ = ₹45/ltr.

T_1 T_2

40 48

45

3 : 5

Required ratio = 3 : 5

76. (d) $CP = \frac{75}{120} \times 100 = 62.5$

Now,

CP CP

78 46

62.5

16.5 15.5

Required ratio → 33 : 31

77. (c) Cost price of tea = $36 \times \frac{4}{5}$

= ₹28.8/kg.

27 31

28.8

2.2 : 1.8

11 : 9

78. (d) ∵ SP per kg. at 30% profit = ₹5.2

∴ CP per kg. = $5.2 \times \frac{100}{130}$ = ₹4

3.80 4.60

4.0

0.6 : 0.2

3 unit : 1 unit

↓×60 ↓

180 kg. 60 kg.

∴ 180 kg. sugar of ₹3.80 should be added.

79. (b) $16\frac{1}{4}\% = \frac{13}{80}$

Let, milk = 80 ⇒(water) = 13

∴ Milk : Water = 80 : 13

80. (a) C-I C-II

500 x

650

$(x - 650)$ 150

2 : 3 ×50

2 unit = 2 × 50 =100

$x - 650 = 100$

∴ x = ₹750

81. (d) Cost price for resulting mixture

= $280 \times \frac{100}{140}$ = ₹200/kg

First type Second type

120 220

200

20 : 80

1 unit : 4 unit

↓×18 ↓

18 kg. 72 kg.

82. (b) CP = 50 × 30 = 1500

SP = 48 × (30 + 20) = 2400

$\text{Profit\%} = \frac{2400 - 1500}{1500} \times 100$

$= \frac{900}{1500} \times 100 = 60\%$

83. (c) Final S.P = 56 , Profit% = 12%

$C.P = \frac{56}{112} \times 100 = 50$

By alligation:

₹60 ₹42

₹50

8 : 10

4 : 5

↓ ↓

19.2 kg. 24 kg.

84. (a) A B C

20% 30% 40%

3 : 5 : a

ATQ,

$60 + 150 + 40a = 30 \times (8 + a)$

$\Rightarrow 210 + 40a = 240 + 30a$

$\therefore a = 3$

Alternate Method:-

A B

20 30

x

3 5

$\frac{30 - x}{x - 20} = \frac{3}{5} \Rightarrow 150 - 5x = 3x - 60$

$\Rightarrow x = \frac{105}{4}$

A+B C

105 160

120

40 : 15

$\times\frac{1}{5}$

8 : a

$\therefore a = 3$

85. (b) 60 Litre = 16 unit

20 Litre = $\frac{16}{3}$ unit

In container A

S : W

60L 7 : 9

20L $\frac{16}{3}$

7 : $9 + \frac{16}{3}$

21 : 43

In container B

20L → 7 : 9 = 16 | ×4 × 5

32L → 21 : 43 = 64 | ×1 × 8

77 : 131

Alternate Method:

S : W

Sol → 7 : 9

$\frac{\text{Spirit}}{\text{Total}} \rightarrow \frac{7}{16} \times \frac{(80-20)}{80}$

$= \frac{7}{16} \times \frac{3}{4} = \frac{21}{64}$

S : W

20L → 7 : 9 = 16 | × 4 × 5

32L → 21 : 43 = 64 | × 1 × 8

S : W

140 : 180

168 : 344

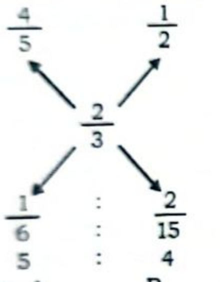
308 : 524

77 : 131

86. (c) $80\% = \frac{4}{5}$, $50\% = \frac{1}{2}$

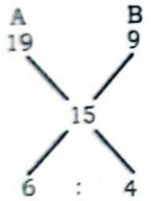
By alligation method,

Vessel-1 Vessel-2



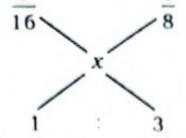
5 : 4

87. (d)



3 : 2

88. (d) Aluminum 1 Aluminum 2



$$x = \frac{1 \times \frac{5}{16} + 3 \times \frac{3}{8}}{4} = \frac{23}{64}$$

∴ Aluminum Copper

23 : 41

$$\text{Required \%} = \frac{23}{41} \times 100$$

$= 56.09 \approx 56\%$

Alternate Method:

Alu : Copper

5 : 11 = 16 | ×1 ×1

3 : 5 = 8 | ×2 ×3

Alu : Copper

5 : 11

18 : 30

23 : 41

$$\text{Required\%} = \frac{23}{41} \times 100 = 56.09\%$$

89. (a)

Sugar : Water

Pomegranate Juice → (1 : 9) × 2

Orange → (3 : 7) × 3

2 : 18

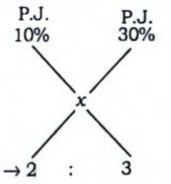
9 : 21

11 : 39

$$\text{Required \%} = \frac{11}{11+39} \times 100$$

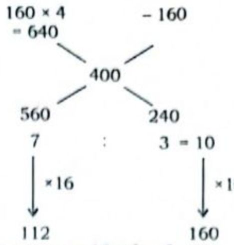
$= \frac{11}{50} \times 100 = 22\%$

Alternate Method:



$$\therefore x = \frac{10 \times 2 + 30 \times 3}{2+3} = \frac{110}{5} = 22\%$$

90. (c) Correct Incorrect/unattempted



Alternate Method:-

Let, No. of correct answer = x

No. of incorrect/unattempted answer = $(160 - x)$

ATQ, $4x + (160 - x) \times (-1) = 400$

$4x - 160 + x = 400 \Rightarrow x = 112$

No. of correct answer = 112

91. (d) The cost of 3 kg. Rice = ₹180

The cost of 1 kg. Rice = ₹60

The cost of 5 kg. pulse = 8 × 60 = ₹480

The cost of 15 kg. Pulse = ₹1440

The cost of 2 kg. Tea = ₹1440

The cost of 3 kg. Tea = The cost of 6 kg. walnuts = ₹2160

The cost of 6 kg. walnuts = ₹2160

The cost of 10 kg. walnuts

$= \frac{2160}{6} \times 10 = 3600$

Alternate Method:

8R : 5P

15P : 2T

3T : 6W

$\frac{R}{1} : \frac{W}{6}$

(1) unit → 60 ⇒ (6) unit → 360

Cost of 10 kg walnut = ₹360 × 10

= ₹3600

92. (b) Cu : Tin

A → (1 : 2)×4

B → (1 : 3)×3

A → 4 : 8

B → 3 : 9

C → 7 : 17

SPEED BOOSTER HACKS

◆ Square Root of perfect square ◆

Calculate the square root of 5184

Step 01: The unit digit of 5184 is 4, so its square root will be end on 2 or 8.

Step 02: Now leave two digits from end and check the remaining number. In this, case it is 51.

$7^2 < 51 < 8^2$

So, the tens digit of square root is 7.

Step 03: Now the square root of 5184 can be 72 or 78. For this, we have to check whether 51 is closer to 7^2 or 8^2 As 51 is closer to 7^2.

Square root of 5184 is 72.

◆ Do it Yourself ◆

(i) $\sqrt{7744}$ = ...

(ii) $\sqrt{1764}$ = ...

(iii) $\sqrt{6561}$ = ...

(iv) $\sqrt{7396}$ = ...

(v) $\sqrt{9216}$ = ...

(vi) $\sqrt{4624}$ = ...

(vii) $\sqrt{7569}$ = ...

11
Chapter

AVERAGE

◆ TYPE – I ◆
BASIC QUESTIONS

1. The weights of the five friends are 67 kg, 85 kg, 70 kg, 90 kg and 103 kg. Find the average of their weights in kg.

SSC CHSL 08/07/2024 (Shift-01)

(a) 80 (b) 90
(c) 87 (d) 83

2. At a courier shop, the weights of 8 parcels were found to be 1.5 kg, 1.25 kg, 1.35 kg, 750 gm, 950 gm, 0.7 kg, 0.4 kg, and 0.5 kg. Find their average weight.

SSC CPO 03/10/2023 (Shift- 02)

(a) 925gm (b) 700gm
(c) 875gm (d) 900gm

3. The salaries of T in twelve months of a year are: ₹12,000, ₹12,000, ₹12,000, ₹15,000, ₹15,000, ₹15,000, ₹21,000, ₹21,000, ₹21,000, ₹30,000, ₹30,000, ₹30,000. The average salary of T per month in ₹ is _______.

SSC CHSL 03/07/2024 (Shift-02)

(a) 18000 (b) 19500
(c) 18500 (d) 19000

4. From the following table, find the average weight (in kg) of the given persons?

Name	Weight (kg)/
Aman	52.7
Sudha	54
Vishal	55.2
Sumedha	57.4
Sahil	58.7
Usha	58

SSC Phase XII 25/06/2024 (Shift-03)

(a) 56 (b) 55.5
(c) 56.33 (d) 54.33

5. If the average of 20, 25, (p + 1) (2p + 5) and (p + 11) is 22, then the value of p is:

SSC Selection Post Phase IX

(a) 8 (b) 16
(c) 18 (d) 12

6. Find the average of 3^{20}, 3^{30}, 3^{40}.

Selection Post 03/08/2022 (Shift-03)

(a) $(3^{20} + 3^{10} + 3^{40})$
(b) 3^{30}
(c) $(3^{20} + 3^{30} + 3^{40})$
(d) $(3^{19} + 3^{29} + 3^{39})$

7. During a donation drive week of school. Students determined to donate an average sum of ₹ 8000 on each working day of the School, collectively (there was no holiday in the donation week except Sunday). From Monday to Friday, they collected ₹ 7230, ₹ 6435, ₹6855, ₹6927 and ₹ 6562, respectively. How much they must collect on Saturday to meet their target?

SSC CHSL 09/08/2023 (Shift-02)

(a) ₹ 6991 (b) ₹ 13991
(c) ₹ 6000 (d) ₹ 4991

8. A man bought 4 books for ₹50 each, 5 books for ₹60 each and 6 books for ₹70 each. The average cost of a book for the man is (round up to two decimal places):

SSC CHSL 04/07/2024 (Shift-04)

(a) ₹60.33 (b) ₹50.33
(c) ₹36.33 (d) ₹61.33

9. In June, Rohit's bank account balance is ₹5,000 for 25 days, ₹20,000 for 2 days and ₹1,500 for 3 days. What is the average balance (in ₹) in Rohit's bank account in june ?

SSC CHSL 02/07/2024 (Shift-04)

(a) 5575 (b) 5650
(c) 5200 (d) 6000

10. The average monthly expenditure of a family was ₹2,500 during the first 4 months, ₹2,750 during the next 5 months and 3,550 during the last 3 months of a year. If the total saving during the year was ₹5,500, what was the average monthly income of the family?

SSC CHSL 02/07/2024 (Shift-02)

(a) Rs.3,325 (b) Rs.4,375
(c) Rs.5,790 (d) Rs.7,355

11. In a subject, there are 40 marks for practical and 110 marks for theory. In another subject, the practical marks are 60 and the theory marks are 40. If R gets an average mark of 40 in practical and an average mark of 60 in theory, then his average marks per subject are _______.

SSC MTS 12/09/2023 (Shift-03)

(a) 80 (b) 60
(c) 100 (d) 40

12. In ₹150, B buys 10 pens for ₹8 each, 10 erasers for ₹5 each and some sharpeners for ₹4 each. What is the average price per item in ₹?

SSC CGL 19/07/2023 (Shift-03)

(a) 8 (b) 7
(c) 10 (d) 6

13. In a company, the total number of customer calls on Monday, Wednesday and Friday are 15,500 and the total number of calls on Tuesday and Thursday are 12,500. The average call numbers on Saturday and Sunday are 7,000. So tell me how many average calls are made per day in a week?

Selection post 28/06/2023 (Shift-01)

(a) 6500 (b) 7500
(c) 7000 (d) 6000

14. The average monthly income of A and B is ₹7,000. The average monthly income of B and C is ₹7,750 and the average monthly income of C and A is ₹6,750. What is the monthly income of B?

SSC CHSL 13/03/2023 (Shift-04)

(a) ₹6,500 (b) ₹8,000
(c) ₹7,500 (d) ₹6,000

15. A man spends ₹2300 monthly on average for the first four months and ₹1800 monthly for the next eight months and saves ₹12,400 a year. Find his monthly income.

SSC CHSL 20/03/2023 (Shift-03)

(a) ₹3,000 (b) ₹2,400
(c) ₹2,200 (d) ₹2,100

16. The average marks obtained by Saloni in four papers is 51, and in the fifth paper she obtained 56 marks. Find his new average in all the five papers.

SSC CGL TIER II 06/03/2023

(a) 52 (b) 49
(c) 50 (d) 51

17. If the average of s number is r^4 and the average of r number is s^4, then find the average of all r + s number?

SSC CGL 09/12/2022 (Shift-04)

(a) $rs\,(r^2 + s^2 - rs)$ (b) rs
(c) $r^2 + s^2$ (d) $rs\,(r^2 + s^2)$

18. In a Hindi exam of 100 marks, 11 students got 78 marks, 7 students got 80 marks, 5 students got 82 marks and 2 students got 86 marks. What was the average marks in Hindi?

Selection Post 04/08/2022 (Shift-02)

(a) 84 (b) 86
(c) 82 (d) 80

19. A shopkeeper has a sale of ₹5,445, ₹5,937, ₹5,865 and ₹6,562 for 4 consecutive days. If he gets an average sale of ₹6,050 for 5 days, then his sale on the fifth day is:

SSC CPO 04/10/2023 (Shift-01)

(a) ₹6,131 (b) ₹6,441
(c) ₹6,231 (d) ₹6,341

20. The average of 11 results is 59 and that of the first 10 is 58. The 11th result is?

SSC CHSL TIER-II (18/11/2024)

(a) 58 (b) 68
(c) 69 (d) 59

21. The average of five integers is 48. The average of the first four integers is 50% of the 5th integer. The 5th integer is.

SSC CHSL TIER-II (18/11/2024)

(a) 74 (b) 80
(c) 78 (d) 82

22. A shopkeeper has a sale of ₹10,000, ₹7,500, ₹8,000 and ₹10,500 for 4 consecutive months. How much sale must he have in the fifth month so he gets an average sale of ₹9,000 in five months ?

SSC CHSL 16/03/2023 (Shift-04)

(a) ₹10,200 (b) ₹8,500
(c) ₹11,000 (d) ₹9,000

23. The average of 50 numbers is 23. If each number is multiplied by 13, then the new average is:

SSC CHSL 11/07/2024 (Shift-02)

(a) 299 (b) 88
(c) 219 (d) 650

24. If the average of 50 number N_1, N_2 ____ N_{50} is M. Then the average of the number N_1-100, N_2-100 ____ $N_{50}-100$ will be:

SSC CHSL 03/07/2024 (Shift-02)

(a) 50 M (b) 100 M
(c) M – 50 (d) M – 100

25. The average of twelve numbers is 25. If 6 is added to each number, what will be the new average?

Selection Post 02/08/2022 (Shift-02)

(a) 31 (b) 20
(c) 25 (d) 19

26. The average of n numbers is 45. If 60% the numbers are increased by 5 each and the remaining numbers are decreased by 10 each, then what is the average of the numbers so obtained?

SSC CGL TIER-II 03/02/2022

(a) 42 (b) 43
(c) 46 (d) 44

27. Consider ten consecutive odd numbers starting from 5. Multiply each of them, except the first and the second, with three. What will be the average of the ten numbers so formed?

SSC MTS 05/10/2021 (Shift-01)

(a) 39.6 (b) 39
(c) 42 (d) 38.4

28. The average of six numbers is 4. The average of two of them is 3.5, while the average of the other two is 3.75. What is the average of the remaining two numbers?

SSC Phase XII 24/06/2024 (Shift-03)

(a) 8.375 (b) 4.85
(c) 4.65 (d) 4.75

29. The average age of 20 students in a class is 12 years. The average age of a group of 5 of the students is 10 years and that of another group of 5 of them is 14 years . The average of the remaining students is:

SSC CHSL 04/08/2023 (Shift-04)

(a) 14 years (b) 12 years
(c) 11 years (d) 13 years

30. Find the weighted arithmetic mean of the first 'n' natural numbers, the weights being the corresponding numbers.

SSC CGL 02/12/2022 (Shift-02)

(a) $\frac{\{n(n+1)(2n+1)\}}{6}$ (b) $\frac{\{n(n+1)\}}{6}$
(c) $\frac{(2n+1)}{3}$ (d) n

31. Sudesh is the owner of a multipurpose shop. For a specific month, his profits are below.

Category	**Profit earned in ₹**
Groceries	50,000
Cosmetics	20,000
Ladies dresses	10,000

In order to estimate the expected profit for the next month, he assigns the weights of 6, 5 and 8 to the different categories in the same order.

What will be the weighted average of his profits?

SSC CHSL 03/08/2023 (Shift-02)

(a) ₹ 25,265.18 (nearly)
(b) ₹ 25,863.16 (nearly)
(c) ₹ 25,163.16 (nearly)
(d) ₹ 25,263.16 (nearly)

32. Sonali applied for a job of Science teacher in a school. In the test for job, she scored 8 in Physics, 8 in Chemistry, 6 in Biology, and 6.5 in the interview. For calculating the final score, weightage of 2, 3, 3, and 4 were assigned to Physics, Chemistry, Biology and interview, respectively. What is the weighted average score of Sonali?

SSC CGL 06/12/2022 (Shift-01)

(a) 7 (b) 8.4
(c) 7.2 (d) 21

♦ TYPE – II ♦
BASED ON CONSECUTIVE NATURAL NUMBERS

33. The average of the first 10 natural numbers is ______.

SSC CHSL 08/07/2024 (Shift-02)

(a) 6 (b) 6.5
(c) 5.5 (d) 5

34. The average of the first 69 natural numbers is:

MTS 04/09/2023 (Shift-01)

(a) 34 (b) 35
(c) 33 (d) 36

35. Find the average of first 125 natural numbers.

SSC CGL 18/09/2024 (Shift-03)

(a) 62.5 (b) 63
(c) 62 (d) 63.5

36. Find the average of natural numbers from 1 to 69. (both included)

SSC CHSL 04/07/2024 (Shift-01)

(a) 33 (b) 31
(c) 37 (d) 35

37. What is the average of natural numbers from 1 to 73?

SSC MTS 13/09/2023 (Shift-03)

(a) 37 (b) 30
(c) 28 (d) 34

38. The average of the squares of the first 45 natural numbers is

SSC CGL 10/09/2024 (Shift-03)

(a) 698.67 (b) 699.67
(c) 697.67 (d) 696.67

39. The average of the squares of the first 46 natural numbers is

SSC CGL 12/09/2024 (Shift-02)

(a) 729.5 (b) 728.5
(c) 727.5 (d) 730.5

40. The average of the squares of the first 47 natural numbers is

SSC CGL 17/09/2024 (Shift-01)

(a) 760 (b) 761
(c) 759 (d) 762

41. The average of the squares of the first 48 natural numbers is

SSC CGL 25/09/2024 (Shift-01)

(a) 793.17 (b) 791.17
(c) 794.17 (d) 792.17

42. Find the average of the squares of the first five even natural numbers.

SSC CHSL TIER II 26/06/2023

(a) 46 (b) 44
(c) 40 (d) 42

43. The average of first 91 even number is

SSC CGL TIER-II (18/01/2025)

(a) 92 (b) 90
(c) 91 (d) 93

44. The average of first 92 even numbers is:

SSC CGL TIER-II (20/01/2025)

(a) 94 (b) 91
(c) 92 (d) 93

45. The average of 10 consecutive integers is $\frac{33}{2}$. What is the average of first three integers?

SSC CHSL 13/03/2023 (Shift-01)

(a) 12 (b) 13
(c) 15 (d) 11

46. 10 Consecutive numbers are given. If the average of the two numbers given in the middle is 13.5, then what is the sum of the first 6 numbers?

SSC CHSL 14/03/2023 (Shift-03)

(a) 58 (b) 55
(c) 67 (d) 69

47. The average of four consecutive even numbers a, b, c and d is 33. The value of |bd – ac| is:

Selection Post 09/02/2022 (Shift-02)

(a) 144 (b) 132
(c) 112 (d) 121

48. The average of 5 consecutive even numbers is A. If next 5 even numbers are also included, then what is the average of these 10 numbers?

SSC CHSL 21/03/2023 (Shift-02)

(a) A + 7 (b) A + 2
(c) A + 9 (d) A + 5

49. What is the difference between the average of first 148 even positive numbers and the average of first 129 odd positive numbers?

SSC CGL TIER II (08/08/2022)

(a) 23 (b) 21
(c) 19 (d) 20

50. The average of square of five consecutive odd natural numbers is 233. What is the average of the largest number and the smallest number?

SSC CGL 20/08/2021 (Shift-01)

(a) 11 (b) 17
(c) 13 (d) 15

51. The average of eleven consecutive positive integers is d. If the last two numbers are excluded, by how much will the average increase or decrease?

SSC CGL 20/04/2022 (Shift-01)

(a) Will decrease by 1
(b) Will increase by 2
(c) Will increase by 1
(d) Will decrease by 2

52. Average of 9 consecutive odd numbers is 27. If the previous and next odd number to these 9 odd numbers are also included, then what will be new average?

SSC CHSL 09/03/2023 (Shift-04)

(a) 32 (b) 28
(c) 29 (d) 27

53. The average of five consecutive even numbers is M. If the next five even numbers are also included, the average of ten numbers will be:

SSC CGL 03/03/2020 (Shift-02)

(a) M + 5 (b) 11
(c) 10 (d) M + 10

54. The average of five consecutive odd numbers is m. If the next three odd numbers are also included, then what is the increase in the average?

SSC CGL 07/03/2020 (Shift-01)

(a) 3 (b) 0
(c) 17 (d) 8

55. The average of 7 consecutive odd numbers is A. If next 3 and previous 2 odd numbers to these 7 odd numbers are also included, then what is the new average of these 12 consecutive odd numbers?

SSC MTS 05/05/2023 (Shift-02)

(a) A + 1 (b) A – 2
(c) A + 2 (d) A + 3

56. The average of 35 consecutive natural numbers is N. Dropping the first 10 numbers and including the next 10 numbers, the average is changed to M. If the value of $M^2 - N^2 = 600$, then the average of 3M and 5N is:

SSC CHSL 13/10/2020 (Shift-01)

(a) 90 (b) 120
(c) 100 (d) 115

57. What is the average of the first six prime numbers?

SSC CPO 05/10/2023 (Shift-03)

(a) $6\frac{2}{3}$ (b) $6\frac{5}{6}$
(c) $6\frac{1}{6}$ (d) $6\frac{1}{3}$

58. Find the average of the prime numbers lying between 50 and 76.

SSC CGL 11/09/2024 (Shift-02)

(a) 66 (b) 60
(c) 62 (d) 64

59. What is the ratio of the average of first eight prime numbers to the average of first ten even natural numbers?

SSC CGL 16/08/2021 (Shift-02)

(a) 1 : 7 (b) 7 : 80
(c) 8 : 70 (d) 7 : 8

◆ TYPE – III ◆
BASED ON WEIGHTED AVERAGE

60. John buys 20 kg of wheat at ₹30 per kg and 30 kg of wheat at ₹50 per kg. Find his average price.

SSC Phase XII 25/06/2024 (Shift-02)

(a) ₹40 per kg (b) ₹20 per kg
(c) ₹42 per kg (d) ₹21 per kg

61. The average score of a batsman in twenty matches is 15 and in twenty-five other matches is 24. Find the average score in all the forty-five matches.

SSC CGL 19/09/2024 (Shift-02)

(a) 21 (b) 20
(c) 19.5 (d) 22

62. A school has two sections of a class. Section A has 30 students and Section B has 20 students. The average score of the students in Section A is 85, and the average score of the students in Section B is 70. What is the overall average score of the class?

SSC MTS 05/09/2023 (Shift-02)

(a) 78 (b) 81
(c) 79 (d) 80

63. In a class of 150 students (boys and girls only), the girls are 60. The average weight of boys is 52 kg and that of girls is 48 kg. What is the average weight (in kg) of the whole class?

SSC CGL 26/09/2024 (Shift-01)

(a) 50.4 (b) 48.8
(c) 49.6 (d) 51.2

64. If the average weight of 40 apples is 33 kg and that of 32 apples is 60 kg, then the average weight (in kg) of all the apples is:

SSC CHSL 10/07/2024 (Shift-04)

(a) 45 (b) 45.2
(c) 46.5 (d) 44

65. A fruit seller has 10 kg of apples and 5 kg of grapes. The price of 1 kg of apples is ₹ 94.50 and that of grapes is ₹105. He sold all the fruits with him. What is the average amount (in ₹) received by the fruit seller?

SSC Phase XII 21/06/2024 (Shift-03)

(a) 101.50 (b) 98
(c) 100 (d) 97.50

66. If the average score of a cricketer in three matches is 38 and in two other matches is 23, then what is the average score in all five matches?

SSC Phase XII 26/06/2024 (Shift-03)

(a) 32 (b) 30
(c) 34 (d) 36

67. Class X has 45 students scoring average marks of 30 and class Y has 35 students scoring average marks of 18. Find the average marks of the students of both classes together.

SSC Phase XII 25/06/2024 (Shift-02)

(a) 25 (b) 24.75
(c) 28.50 (d) 30

68. The average expenditure of 32 persons is ₹ 6,000 and that of another 40 persons is ₹ 3,300. The average expenditure of the whole group is:

SSC MTS 13/09/2023 (Shift-03)

(a) ₹ 4,800 (b) ₹ 4,650
(c) ₹ 4,500 (d) ₹ 4,162

69. The average weight of group A and group B is 12 kg and 24 kg, respectively. The ratio of the members in group A to group B is 1 : 2. Find the combined average of both the groups.

SSC CHSL 02/08/2023 (Shift-02)

(a) 16 kg (b) 22 kg
(c) 20 kg (d) 18 kg

70. In an examination of 7 papers of 100 marks each, there were 3 mathematics papers, 2 English papers and 2 Hindi papers. D gets average marks of 45, 55 and 60 in mathematics, English and Hindi, respectively. What are the average marks per paper?

SSC CGL 26/07/2023 (Shift-04)

(a) 56.5 (b) 52.1
(c) 55.6 (d) 54.1

71. If the average marks of three batches of 55, 60 and 45 students are 50, 55 and 60 respectively, then what are the average marks of all the students?

Selection phase 30/06/2023 (Shift-04)

(a) 51.23 (b) 55.98
(c) 57.42 (d) 54.68

72. In a class, there are 29 boys and 21 girls. The average score of boys in Maths is 89, whereas the average score of girls in maths is 91. What is the average of the whole class in maths?

SSC CHSL 24/05/2022 (Shift-01)

(a) 91 (b) 89
(c) 91.84 (d) 89.84

73. A group of 30 students appeared in a test. The average score of 12 students is 62, and that of the rest is 62. What is the average score of the group?

SSC CGL 11/09/2024 (Shift-01)

(a) 62 (b) 63
(c) 60 (d) 61

74. A class of 30 students appeared in a test. The average score of 12 students is 62, and the of the rest is 74. What is the average score of the class?

SSC CGL 11/09/2024 (Shift-03)

(a) 70.2 (b) 69.2
(c) 68.2 (d) 67.2

75. A class of 30 students appeared in a test. The average score of 12 students is 62, and that of the rest is 72. What is the average score of the class?

SSC CGL 13/09/2024 (Shift-03)

(a) 66 (b) 68
(c) 67 (d) 69

76. A group of 30 students appeared in a test. The average score of 12 students is 62, and that of the rest is 76. What is the average score of the group?

SSC CGL 17/09/2024 (Shift-02)

(a) 71.4 (b) 68.4
(c) 69.4 (d) 70.4

77. A class of 30 students appeared in a test. The average score of 12 students is 62, and that of the rest is 68. What is the average score of the class?

SSC CGL 19/09/2024 (Shift-03)

(a) 63.6 (b) 65.6
(c) 66.6 (d) 64.6

78. A class of 30 students appeared in a test. The average score of 12 students is 62, and that of the rest is 60. What is the average score of the class?

SSC CGL 23/09/2024 (Shift-03)

(a) 58.8 (b) 61.8
(c) 60.8 (d) 59.8

79. A class of 30 students appeared in a test. The average score of 12 students is 62, and that of the rest is 78. What is the average score of the class?

SSC CGL 24/09/2024 (Shift-03)

(a) 72.6 (b) 69.6
(c) 70.6 (d) 71.6

80. A class of 30 students appeared in a test. The average score of 12 students is 60, and that of the rest is 80. What is the average score of the class?

SSC CGL 25/09/2024 (Shift-03)

(a) 73 (b) 70
(c) 71 (d) 72

81. In the 8th class, consisting of 30 students, a Mathematics test was taken. 10 students had an average score of 90. The other students had an average score of 75. What is the average score of the whole class?

SSC CGL 25/09/2024 (Shift-02)

(a) 78 (b) 80
(c) 76 (d) 74

82. A class of 25 students took an English test. 15 students had an average score of 80. The other students had an average score of 60. What is the average score of the whole class?

SSC CHSL 03/07/2024 (Shift-04)

(a) 72 (b) 80
(c) 76 (d) 74

83. In a college, the average weight of 40 boys in a section among 72 students is 33 kg and that of the remaining students is 15 kg. What is the average weight of all the students in the section?

SSC CHSL 04/07/2024 (Shift-02)

(a) 22 kg (b) 24 kg
(c) 18 kg (d) 25 kg

84. Out of a class of 200 people, 50 people's average marks is 40, and the remaining 150 people's average is 60. Find the people's weighted average.

SSC CHSL 11/07/2024 (Shift-03)

(a) 150 (b) 200
(c) 55 (d) 50

85. A class of 40 students took a mathematics examination. The average marks of 18 students was 75. The average marks of other students was 62. What will be the average marks of the entire class?

Selection phase 30/06/2023 (Shift-03)

(a) 67.85 (b) 72.52
(c) 68.50 (d) 69.85

86. In two successive years, 75 and 50 employees of a company appeared at the departmental examination. Respectively, 84% and 52% of them passed. The average rate of pass percentage is:

SSC CHSL 11/07/2024 (Shift-03)

(a) $41\frac{1}{5}\%$ (b) 41%
(c) 71% (d) $71\frac{1}{5}\%$

87. The university has 750 faculty (male and female only) out of which the females are 60%. The average height of females is 162 cm and that of males is 168 cm. What is the average height of the faculty (in cm) of the university?

SSC Phase XII 21/06/2024 (Shift-03)

(a) 164.4 (b) 166.4
(c) 163.4 (d) 161.4

◆ TYPE – IV ◆
BASED ON INCLUSION

88. There are 12 workers in an office and the average age of all the workers is $35\frac{1}{2}$ years. A new worker joins the office, the average becomes 37 years. The current age of the newly joined worker is:

SSC CHSL 01/07/2024 (Shift-04)

(a) 55 years (b) $57\frac{1}{2}$ years
(c) $55\frac{1}{2}$ years (d) $47\frac{1}{2}$ years

89. The average weight of 40 students of a school is 52 kg. If the weight of the teacher is included, the average weight rises by 500 grams. Find the weight (in kg) of the teacher.

SSC CHSL TIER II 02/11/2023

(a) 73.5 (b) 71.5
(c) 74.5 (d) 72.5

90. Average weight of 20 persons is 60 kg. A new person joins the group and average weight of 21 persons becomes 59 kg. What will be the weight of new person?

SSC CHSL 09/03/2023 (Shift-02)

(a) 41 kg (b) 29 kg
(c) 39 kg (d) 40 kg

91. The average height of 5 boys is 175 cm. A sixth boy joined the group and the average height of all the boys in the group now increased by one centimeter. The height of the sixth boy is:

SSC CGL 05/03/2020 (Shift-01)

(a) 180 cm (b) 181 cm
(c) 179 cm (d) 175 cm

92. The average weight of 32 students is 70 kg. If the weight of the teacher is included, the average weight of the class becomes 70.5 kg. Find the weight of the teacher.

Selection Post 04/08/2022 (Shift-03)

(a) 86.5 kg (b) 88.5 kg
(c) 84.5 kg (d) 82.5 kg

93. The average weight of 30 students in a class is 60 kg. If the weight of the class teacher is also included, the average increases by 0.5 kg. Find the weight of the teacher (in kg).

Selection post 27/06/2023 (Shift-04)

(a) 76.5 (b) 75.5
(c) 72.5 (d) 74.5

94. Average weight of 15 persons is 30 kg. A new person whose weight is 78 kg joins the group. What will be the average weight of 16 persons?

SSC CHSL 09/03/2023 (Shift-03)

(a) 31.5 kg (b) 34 kg
(c) 33 kg (d) 32 kg

95. Average age of a team having 12 players is 24 years. If the age of the coach is also included, then the average age increases by 2 years. What is the age of the coach?

SSC CHSL 16/03/2023 (Shift-03)

(a) 53 years (b) 57 years
(c) 50 years (d) 52 years

96. The average weight of some students in a class was 58.4 kg. When 5 students having the average weight 62.8 kg joined the class, the average weight of all students in the class increased by 0.55 kg. The number of students initially in the class, were:

SSC CGL 04/03/2020 (Shift-02)

(a) 30 (b) 35
(c) 25 (d) 40

97. The average weight of a group of 15 students is 70 kg. Five more students of weight 65 kg, 68 kg, 45 kg, 77 kg and 62 kg join the group. What is the change in the average weight (rounded off to the nearest integer) of the group?

SSC Phase XII 24/06/2024 (Shift-03)

(a) Increases by 2 kg
(b) Decreases by 2 kg
(c) Increases by 1 kg
(d) Decreases by 1 kg

98. The average weight of 8 students is 48 kg. If four students of average weight 44 kg and four students of average weight 58 kg is also added, then find the average weight of 16 students.

SSC CPO 05/10/2023 (Shift-01)

(a) 49.5 kg
(b) 49 kg
(c) 48.5 kg
(d) 48 kg

99. The average weight of a certain number of students in a class is 55.5 kg. If 4 students with average weight 60 kg join the class, then the average weight of all students in the class increases by 360 gm. The number of students in the class, initially, is:

SSC CGL 20/08/2021 (Shift-03)

(a) 41
(b) 31
(c) 36
(d) 46

100. In a class with a certain number of students, if one student weighing 30 kg is added, then the average weight of the class increases by 1 kg. If one more student weighing 30 kg is added, then the average weight of the class increases by 1.5 kg over the original average. What is the original average weight (in kg) of the class?

SSC CHSL 09/07/2024 (Shift-04)

(a) 27
(b) 26.5
(c) 25.5
(d) 24

101. The average weight of 20 students of a class was 30.5 kg. After 6 new students joined the class, its average weight increased by 2 kg. Find the average weight of the 6 new students who joined the class (rounded off to one decimal place).

SSC MTS 06/09/2023 (Shift-01)

(a) 30.5 kg
(b) 39.2 kg
(c) 32.5 kg
(d) 38.5 kg

102. The average age of the boys in the class was 16 years. When 4 boys whose average age was 13 years are admitted to the class, the average age of the class was reduced by 6 months. How many boys were there initially in the class?

SSC MTS 12/09/2023 (Shift-01)

(a) 18
(b) 25
(c) 22
(d) 20

103. The average age of a group of friends is 27 years. If 4 new friends whose average age is 25 years join them, the average age of the entire group becomes 26 years. How many people were there in the group initially?

SSC CGL 20/07/2023 (Shift-01)

(a) 3
(b) 4
(c) 5
(d) 6

104. The average marks scored by three students on a test were 55. When two more students (A and B) were added, the new average marks were reduced by 5. If B scores 15 marks more than A, what were the marks scored by A?

SSC CHSL 17/03/2023 (Shift-02)

(a) 33
(b) 35
(c) 40
(d) 30

105. The average age of a class of 6 girls is x years. Four new girls having ages $x - 2$, $x + 4$, $x + 8$ and $x + 10$ joins the class. What is the new average age of the class?

SSC CHSL 09/03/2023 (Shift-03)

(a) $x - 2$
(b) $x + 2$
(c) $x + 5$
(d) $x + 1$

◆ TYPE – V ◆
BASED ON EXCLUSION

106. The average age of 24 workers and their supervisor is 41 years. If the supervisor's age is excluded, the average reduces by 0.75 years. The age of the supervisor is:

SSC CHSL 05/07/2024 (Shift-02)

(a) 59 years
(b) 41 years 9 months
(c) 40 years 9 months
(d) 49 years

107. The average age of 10 students and their class teacher is 17 years. If the age of the class teacher is excluded, the average age of the 10 students is reduced by 2 years. What is the age of the class teacher?

SSC CPO 11/11/2022 (Shift-02)

(a) 38 years
(b) 36 years
(c) 37 years
(d) 35 years

108. In a hotel, there are 120 staff members. Their average weight is 62.5 kg. When one of the staff members leaves the hotel, the average weight is reduced by 250 gm. Find the weight of the staff member who left the hotel.

SSC CGL 09/12/2022 (Shift-01)

(a) 64.25 kg
(b) 78.75 kg
(c) 90.50 kg
(d) 92.25 kg

109. There are six baskets – Green, Red, Blue, Yellow, Black and White. Each basket has some rings in it. The average number of rings in all the six baskets is 38. If the blue basket is removed, the average number of rings in the remaining baskets is 34. How many rings are there in the blue basket?

SSC CPO 09/11/2022 (Shift-03)

(a) 22
(b) 45
(c) 37
(d) 58

110. There are 15 students in a class. Their average weight is 40 kg. When one student leaves the class, the average weight is 39.5 kg. What is the weight of the student who left the class (where kg means kilogram)?

SSC CGL 21/07/2023 (Shift-03)

(a) 47 kg
(b) 42 kg
(c) 52 kg
(d) 48 kg

111. The average of 8 numbers is 18. If one of the numbers is excluded, the average becomes 20. Find the excluded number.

SSC CGL 19/07/2023 (Shift-04)

(a) 6
(b) 10
(c) 8
(d) 4

112. The average weight of 35 students in a class is 40 kg. Five of the students of this class whose average weight is 42 kg left the class. Find the average weight of the remaining 30 students.

SSC CHSL 08/07/2024 (Shift-04)

(a) $26\frac{2}{3}$ kg
(b) $39\frac{2}{3}$ kg
(c) $19\frac{2}{3}$ kg
(d) $49\frac{2}{3}$ kg

113. Average marks obtained by 19 boys of a college is 48. If the highest marks and lowest marks obtained are removed, then the average reduces by 4. What is the average of the highest and lowest marks obtained?

SSC MTS 03/05/2023 (Shift-02)

(a) 82
(b) 80
(c) 84
(d) 76

◆ TYPE – VI ◆
BASED ON REPLACEMENT

114. The average weight of 5 men decreases by 3 kg when one of them weighing 150 kg is replaced by another person. Find the weight of the new person.

SSC CGL 05/12/2022 (Shift-02)

(a) 125 kg
(b) 100 kg
(c) 120 kg
(d) 135 kg

115. The average weight of 10 students is increased by half a kg when one of the students weighing 51 kg is replaced by a new student. Find the weight of the new student.

SSC CGL 18/09/2024 (Shift-02)

(a) 56 kg
(b) 75 kg
(c) 45 kg
(d) 66 kg

116. The average weight of 5 boys is increased by 9 kg when one of them, whose weight is 39 kg, is replaced by another boy. What is the weight (in kg) of the new boy?

SSC Phase XII 24/06/2024 (Shift-02)

(a) 65
(b) 70
(c) 69
(d) 84

117. The average weight of 10 persons is increased by 3.5 kg, when one of them whose weight is 45.5 kg is replaced by a new man. The weight (in kg) of the new man is ______.

SSC Phase XII 26/06/2024 (Shift-02)

(a) 70.5
(b) 85.5
(c) 80.5
(d) 75.5

118. The average weight of 15 people increases by 3.2 kg when a new person comes in place of one of them weighting 52 kg. The weight of the new person is:

SSC CPO 03/10/2023 (Shift-03)

(a) 96 kg
(b) 100 kg
(c) 52 kg
(d) 48 kg

119. The average weight of three men is increased by 4 kg when one of them, whose weight is 100 kg, is replaced by another man. What is the weight of the new man?

SSC CGL TIER II 03/03/2023

(a) 107 kg. (b) 103 kg.
(c) 104 kg. (d) 112 kg

120. The average weight of a class of 30 students is 45 kg. One of the student weight is 48.5 kg is replaced by another student and average was increased by 200 gm. Find the weight of the new student.

SSC CHSL 11/08/2023 (Shift-01)

(a) 54.5 kg (b) 50 kg
(c) 55 kg (d) 51 kg

121. The average weight of 49 students in a class is 39 kg. Seven of them whose average weight is 40 kg leave the class and other seven students whose average weight is 54 kg join the class. What is the new average weight (in kg) of the class?

SSC CGL 02/12/2022 (Shift-04)

(a) 41 (b) 39
(c) 42 (d) 40

122. The average score in an English exam of a class of 45 students in a coaching centre is 52. A group of 6 boys having an average score of 40 leave the class and another group of eight boys having an average score of 43 join the class. What is the new average score of the class?

SSC CPO 11/11/2022 (Shift-03)

(a) 48 (b) 53
(c) 49.5 (d) 52

123. There are some children in a camp and their average weight is 40 kg. If 5 children with average weight 36 kg join the camp or if 5 children with average weight 43.2 kg leave the camp, the average weight of children in both cases is equal. How many children are there in the camp, initially?

SSC CGL 23/08/2021 (Shift-03)

(a) 35 (b) 45
(c) 40 (d) 50

124. The average height of a certain number of students in a group is 155.6 cm. If 12 students having an average height of 150.5 cm join the group and 7 students having an average height of 159 cm leave the group, the average height of the students in the group will decrease by 34 mm. What is the number of students, initially, in the group?

SSC CHSL 05/08/2021 (Shift-01)

(a) 40 (b) 30
(c) 20 (d) 25

125. The average weight of a certain number of students in a group is 72kg. If 10 students having an average weight of 78 kg leave and 4 students having an average weight of 80 kg join the group, the average weight of the students in the group decreases by 0.7kg. The number of students initially in the group is:

SSC CGL TIER-II 12/09/2019

(a) 56 (b) 46
(c) 44 (d) 54

126. The average weight of a group of 12 girls is 48 kg. If 2 girls R and S replace P and Q, the new average weight becomes 46 kg. The weight of P = the weight of Q. The weight of R = the weight of S. Another girl T, is included in the group and the new average weight becomes 46 kg. The weight of T = the weight of R. What is the weight of P (in kg)?

Selection post 16/03/2022 (Shift-03)

(a) 56 (b) 58
(c) 54 (d) 50

127. The average weight of a group of 12 children is 66 kg. If instead of A and B, 2 children, X and Y, join the group, then the new average weight becomes 65 kg. Weight of A = weight of B and weight of X = weight of Y. Another child C is added to the group and the new average weight remains 65 kg. Weight of C = Weight of X. Find the weight of A?

SSC CHSL 04/08/2023 (Shift-03)

(a) 67 kg (b) 69 kg
(c) 71 kg (d) 72 kg

◆ TYPE – VII ◆
BASED ON WRONGLY ENTERED DATA

128. The average age of 30 students is 15 years. It was observed that while calculating the average age the age of a student was taken as 15 years instead of 9 years. What will be the correct average?

SSC CHSL 09/03/2023 (Shift-01)

(a) 14.2 years (b) 16.4 years
(c) 15.6 years (d) 14.8 years

129. The average of 45 numbers was found to be 39. Later on, it was detected that a number 65 was misread as 56. Find the correct average of the given numbers.

SSC CPO 05/10/2023 (Shift-02)

(a) 36.2 (b) 37.2
(c) 38.2 (d) 39.2

130. Anwesha's marks in a class test of Sanskrit were incorrectly entered as 99 instead of 66. If there are 55 students in the class, then what is the increment in the average marks of the class in Sanskrit because of this typing error?

SSC CPO 28/06/2024 (Shift-01)

(a) 0.2 (b) 0.8
(c) 0.4 (d) 0.6

131. The average of the marks of 25 students in a class, in an examination was calculated to be 19. Later, the teacher realized that the marks of two students were taken as 18 and 19 respectively, instead of 14 and 15. Find the new actual average marks of the class.

SSC CGL 01/12/2022 (Shift-02)

(a) 17.43 (b) 16.56
(c) 18.68 (d) 17.65

132. The average of 16 numbers is 35. It was found later that four numbers 18, 17, 24 and 35 were taken by mistake. What is the new average after removing these numbers?

SSC CHSL 14/03/2023 (Shift-02)

(a) 38.83 (b) 42.33
(c) 46.66 (d) 33.33

133. Abhishek's marks in Mathematics were incorrectly entered as 93 instead of 63. Due to this, the average marks of the class in Mathematics got increased by 0.5. How many students were there in the class?

SSC CHSL 05/07/2024 (Shift-01)

(a) 45 (b) 55
(c) 60 (d) 50

134. The weight of a person was entered incorrectly as 83 kg instead of 63 kg. As a result, the average weight of a group of people increased by 500 gm. What is the total number of people in the group?

SSC CPO 11/11/2022 (Shift-02)

(a) 44 (b) 48
(c) 40 (d) 50

135. The average age of a number of persons in a group was calculated as 35 years, which was 2.5 years more than the correct average as there was an error in recording the age of two persons as 38.5 years and 40 years instead of 29 years and 22 years respectively. The number of persons in the group was:

SSC CGL 04/03/2020 (Shift-02)

(a) 11 (b) 12
(c) 15 (d) 13

◆ TYPE – VIII ◆
BASED ON ALLIGATION

136. The average marks (out of 100) of boys and girls in an examination are 75 and 80, respectively. If the average marks of all the students in that examination are 78. Find the ratio of the number of boys to the number of girls.

SSC CGL 09/09/2024 (Shift-01)

(a) 2 : 3 (b) 3 : 4
(c) 1 : 3 (d) 1 : 2

137. The average salary of a group of 12 employees in an institution is ₹3,950 per month and that of another group of employees is ₹1,850. If the average salary of all employees is ₹2,150, then the total number of employees is:

SSC CHSL 09/07/2024 (Shift-02)

(a) 100 (b) 88
(c) 84 (d) 72

138. The average marks scored by the students of a class is 75. If the average marks scored by the girls in the same class is 90 and that of boys is 70, what is the percentage of boys in the class?

SSC CHSL 09/07/2024 (Shift-03)

(a) 70% (b) 75%
(c) 65% (d) 60%

139. In a company, the average salary of all the employees is ₹ 20,000. The average salary of employees in group A is ₹ 32,000 while the average salary of employees in group B is ₹18,000. If there are 72 employees in group B then what is the number of employees in group A?

Selection Post 02/08/2022 (Shift-03)

(a) 9 (b) 12
(c) 6 (d) 8

140. The average marks obtained by 80 students in an examination is 50. If the average marks of passed students is 55 and the number of students who failed the examination are 30, then what is the average marks of students who failed the examination?

SSC CHSL 21/03/2023 (Shift-04)

(a) 41.66 (b) 46.66
(c) 40.33 (d) 52.33

141. In a class, there are 60 students. The average weight of the entire class is 42 kg. If there are 36 boys in the class and the average weight of all the boys is 50 kg, then what is the average weight (in kg) of all the girls?

SSC CPO 28/06/2024 (Shift-02)

(a) 30 (b) 32
(c) 36 (d) 34

142. Rakesh runs a coaching institute having 50 faculty members. The average monthly salary of 35 faculty members is ₹37,500. What will be the average monthly salary (in ₹) of the other 15 faculty members, if the average monthly salary of all the 50 faculty members is found to be ₹30,000?

SSC CPO 05/10/2023 (Shift-03)

(a) 12,000 (b) 13,000
(c) 12,500 (d) 13,500

143. In a group of 108 persons, the ratio of the number of males and females is 5 : 4. The average height of the males is 158.7 cm and that of the females is x cm. If the average height of all the persons in the group is 155.5 cm, then the value of x is:

SSC MTS 27/10/2021 (Shift-02)

(a) 152.2 (b) 153.4
(c) 151.5 (d) 150.8

144. The average score in Mathematics of 90 students of section A and B of class IX was 63. The number of students in A were 10 more than those in B. The average score of students in A was 30% more than that of students in B. The average score of students in B is:

SSC CGL TIER-II 15/11/2020 (Shift-01)

(a) 60 (b) 54
(c) 50 (d) 56

145. In a test, the average score of 50 students is 66. Out of the total students, 40% are girls and the rest are boys. The average score of the boys is 20% less than that of the girls. What is the average score of the girls?

SSC CHSL 24/05/2022 (Shift-02)

(a) 70 (b) 80
(c) 75 (d) 65

146. In a class of 60 students, 20 are girls. The average weight of the boys in the class is 40 kg, while that of all the girls is 35 kg. What is the average weight (in kg) of the entire class (correct to two decimal places)?

SSC CGL 24/07/2023 (Shift-02)

(a) 36.67 (b) 38.33
(c) 33.33 (d) 40.67

147. The average weight of apples in a basket is 50 kg. 6 more apples with the average weight of 60 kg are added in the basket. If the average weight of the basket is increased by 5 kg, then find the number of apples in the basket originally.

SSC CGL 07/12/2022 (Shift-04)

(a) 4 (b) 6
(c) 2 (d) 8

◆ TYPE – IX ◆
BASED ON CRICKET

148. A batsman in his 13th innings makes a score of 97 runs, there by increasing his average score by 5. What is his average score after the 13th innings?

SSC CHSL 11/08/2021 (Shift-01)

(a) 37 (b) 57
(c) 77 (d) 67

149. The average number of runs scored by a cricketer in 42 innings is 30. The difference between his maximum and minimum scores in an inning is 100. If these two innings are not taken into consideration, then the average score of remaining 40 innings is 28. What are the maximum runs scored by him in an inning.

SSC CHSL 08/08/2023 (Shift-03)

(a) 120 (b) 105
(c) 110 (d) 115

150. The average score of 22 players in an IPL match is 72. Out of these 22 players, the average score of 10 players is 80, the next 5 players got an average score of 75 and the rest 5 players got an average of 55. Then the average score of the remaining two players is:

SSC MTS 12/09/2023 (Shift-02)

(a) 72 (b) 80
(c) 65 (d) 67

151. In the first 10 overs of a cricket game, the run rate was only 7.2. What should be the average run rate in the remaining 40 overs to reach the target of 272 runs?

SSC CGL 11/04/2022 (Shift-02)

(a) 4 (b) 5
(c) 6 (d) 7

152. The average runs scored by Sumit in the first 3 matches is 122. In the 4th match, he scored some runs such that his average runs now become 130. In the 5th match, he scored 14 less runs than those in the 4th match, and now the average of his last 4 matches becomes 164. The runs scored by Sumit in the 1st match is:

Selection Post 14/03/2022 (Shift-02)

(a) 9 (b) 3
(c) 5 (d) 4

◆ TYPE – X ◆
BASED ON AGE

153. The average age of six members of a family is 40 years. If the age of a guest is included, then the average age increases by 12.5%. What is the age (in years) of the guest?

SSC CGL 12/12/2022 (Shift-04)

(a) 59 (b) 65
(c) 75 (d) 69

154. Average age of three boys, are 25 years and their ages are in the ratio of 3 : 5 : 7. What is the age of youngest boy'?

SSC CPO 04/10/2023 (Shift-01)

(a) 21 years (b) 12 years
(c) 24 years (d) 15 years

155. The average age of Abhay, his wife and Their child 6 years ago was 42 years and that of his wife and their child 8 years ago was 30 years. Find the present age of Abhay.

SSC CHSL 20/03/2023 (Shift-04)

(a) 68 years (b) 63 years
(c) 64 years (d) 66 years

156. Average age of 7 students of a class is 28 years. Average age of first three students is 30 years. Age of fourth student is 4 years less than the age of fifth student. Ages of last two students is same and is 5 more than the average age of first three students. What is the average age of fourth and fifth student?

SSC CGL TIER II (08/08/2022)

(a) 20 years (b) 18 years
(c) 36 years (d) 16 years

157. Eight years ago, the average age of A, B and C was 22 years. The average age of A and C after 2 years from now will be 32.5 years. What will be the age (in years) of B after 3 years from now?

Selection Post 14/03/2022 (Shift-01)

(a) 37 (b) 31
(c) 39 (d) 32

158. The average age of a 10-person committee increases by 3 when three men aged 35 years, 48 years and 49 years are substituted by three women. The average age (in years) of the three women is:

SSC MTS 18/10/2021 (Shift-02)

(a) 54 (b) 74
(c) 64 (d) 44

159. If the average age of three persons is 56 years and their ages are in the ratio 2 : 5 : 7, then find the age of the youngest person.

SSC CGL TIER-II (18/01/2025)

(a) 20 years (b) 22 years
(c) 24 years (d) 26 years

160. The average ages of Kishore, his wife and their child 6 years ago was 38 years and that of his wife and then child 8 years ago was 32 years. Find the present age of Kishore.

SSC CGL TIER-II 18/11/2020

(a) 52 years (b) 48 years
(c) 50 years (d) 55 years

161. The average age of 120 members of a society is 62.5 years. By addition of 30 new members, the average age becomes 58.2 years. What is the average age of newly joined member's:

SSC CHSL 09/03/2023 (Shift-02)

(a) 40 years (b) 41 years
(c) 39 years (d) 42 years

◆ TYPE – XI ◆
BASED ON NUMBERS

162. The average marks of 13 students is 67. If the average marks of the first seven students is 61 and the average marks of the last seven students is 65, then what is the marks of the seventh student?

Selection post 30/06/2023 (Shift-02)

(a) 11 (b) 9
(c) 7 (d) 6

163. Out of a total of 9 books arranged in a particular order, the mean of the number of pages in the first 5 books is 430, the mean of the number of pages in the last 5 books is 380 and the mean of the number of pages in all the 9 books is 400. Find the number of pages in the fifth book.

SSC MTS 20/07/2022 (Shift-02)

(a) 450 (b) 420
(c) 430 (d) 440

164. Of the five subjects, the average marks of Rakesh in first 3 subjects was 75 and the average marks in the last 3 subjects was 82. If his marks in the third subject was 66, what was his average marks in all the 5 subjects?

SSC CHSL 10/03/2023 (Shift-03)

(a) 76 (b) 84
(c) 80 (d) 81

165. The average of 15 results is 21. The average of the first 7 of those is 21 and the average of the last 7 is 20. What is the 8th result?

SSC CPO 10/11/2022 (Shift-02)

(a) 25 (b) 31
(c) 28 (d) 22

166. The average of 20 numbers is 32. If two numbers are 29 and 31, then what is the average of the remaining numbers (correct up to two decimals)?

SSC CGL TIER II 03/03/2023

(a) 31.24 (b) 30.22
(c) 34.44 (d) 32.22

167. Ras Bihari, a plumber, earned on an average ₹ 925 per day in the month of January. He earned on an average ₹ 881 per day during the first 20 days and ₹ 915 per day during the last 20 days. What was his average income (in ₹) per day from 12th January to 20th January?

SSC CGL 21/04/2022 (Shift-03)

(a) 875 (b) 792
(c) 805 (d) 800

168. The average daily production of toys in a factory in the month of December is 512. If the average production during the first 20 days is 515 and that of the last 13 days is 510, then what is the average of production on 19 and 20 December?

SSC CGL 18/08/2021 (Shift-03)

(a) 1058 (b) 529
(c) 513 (d) 512

169. The average temperature of a city for the first sixteen days of January is 22°C, and the average temperature for the last sixteen days of the same month is 26°C. If the average temperature for the entire month is 24°C, what is the temperature on the sixteenth day?

SSC CGL 09/09/2024 (Shift-02)

(a) 24° C (b) 25° C
(c) 23° C (d) 22° C

170. The average temperature of a city for the first four days of the week is 25°C, and the average temperature for the last four days is 30°C. If the average temperature for the entire week is 27°C, then what is the temperature on the fourth day?

SSC Phase XII 24/06/2024 (Shift-02)

(a) 30°C (b) 31°C
(c) 29°C (d) 28°C

171. The average of twenty-five numbers is 54. The average of the first 13 numbers and that of the last 13 numbers is 52.8 and 62.2, respectively. If the 13th number is excluded, then what is the average of the remaining numbers (correct to one decimal place)?

SSC CGL TIER-II 16/11/2020

(a) 51.2 (b) 49.8
(c) 50.2 (d) 50.6

172. The average of 28 numbers is 77. The average of first 14 numbers is 74 and the average of last 15 numbers is 84. If the 14th number is excluded, then what is the average of remaining numbers?
(correct to one decimal place)

SSC CGL 13/08/2021 (Shift-01)

(a) 77 (b) 74.7
(c) 76.9 (d) 73.1

173. The average of 19 numbers is 48. The average of the first 7 numbers is 50.6 and that of the last 13 numbers is 47.6. If the 7th number is excluded, then what is the average of the remaining numbers (correct to one decimal place)?

SSC CHSL 04/08/2021 (Shift-03)

(a) 49.5 (b) 47.3
(c) 39.6 (d) 42.4

174. The average of 25 numbers is 64. The averages of the first 13 numbers and that of the last 13 numbers are 62.8 and 72.2, respectively. If the 12th number is 61, and if the 12th and 13th numbers are excluded, then what is the average of the remaining numbers (correct to one decimal place)?

SSC CGL TIER-II 03/02/2022

(a) 59.2 (b) 62.2
(c) 60.2 (d) 61.5

175. The average of 12 numbers is 47. The average of the first 5 numbers is 45 and the average of the next 4 numbers is 52. If the 10th number is 10 less than the 11th number and is 5 more than the 12th number, then what is the average value of the 11th and 12th numbers?

SSC Phase XII 20/06/2024 (Shift-03)

(a) 44.5 (b) 47.5
(c) 42.5 (d) 46.5

176. The average of 12 numbers is 48. The average of the first 5 numbers is 45 and the average of next 4 numbers is 52. If the 10th number is 10 less than the 11th number and is 5 more than the 12th number, then the average of the 11th and 12th numbers is:

SSC CGL 12/09/2024 (Shift-01)

(a) 50.5 (b) 46.5
(c) 47.5 (d) 48.5

177. In the month of March, Dalip earned on an average ₹501 per day. For the first 18 days, his average earning was ₹495 and for the last 15 days, his average earning as ₹505. On 18th March, he earned ₹50 more than that earned on 17th March. How much (in ₹) did he earn on 18th March?

SSC CGL 21/04/2022 (Shift-02)

(a) 498 (b) 500
(c) 501 (d) 502

178. The average of sixteen numbers is 48. The average of the first six of these numbers is 45 and that of the last seven numbers is 53. The seventh and the eighth numbers are, respectively, 3 and 7 greater than the ninth number. What is the average of the ninth and seventh numbers?

SSC CGL 13/04/2022 (Shift-02)

(a) 42 (b) 41.5
(c) 39 (d) 40.5

179. The average of twelve numbers is 39. The average of the last five numbers is 35, and that of the first four numbers is 40. The fifth number is 6 less than the sixth number and 5 more than the seventh number. The average of the fifth and sixth numbers is:

SSC CPO 23/11/2020 (Shift-01)

(a) 39 (b) 50
(c) 44 (d) 47

◆ TYPE – XII ◆
MISCELLANEOUS QUESTIONS

180. The average temperature for Monday, Wednesday and Friday was 41°C. The average temperature for Wednesday, Friday and Thursday was 42°C. If the temperature on Thursday was 43°C, then the temperature on Monday was:

SSC CPO 24/11/2020 (Shift-02)

(a) 43°C (b) 41°C
(c) 42°C (d) 40°C

181. The mean of three numbers $\frac{a}{3}$, b and c is the same as the mean of the numbers $\frac{b}{3},\frac{c}{3}$ and x. The value of $3x$ is (where a, b, c are positive numbers):

SSC CHSL 26/05/2022 (Shift-02)

(a) b + c (b) a + 2b + 2c
(c) a (d) a + 3b + 3c

182. The average of 52, 71, 43, 22, a, and b is 55 and the average of 42, 45, 49, 51, 42, c, and d is 53. What is the average of a, b, c, and d?

SSC CGL 11/04/2022 (Shift-03)

(a) 54.7 (b) 71
(c) 54 (d) 142

183. Of the three numbers, second is one-third of first and is also three-fourth of the third number. If the average of three numbers is 112, then what is the smallest number?

SSC CGL 19/04/2022 (Shift-01)

(a) 63 (b) 45
(c) 84 (d) 189

184. If A is $\frac{1}{6}$ of C, and B is twice of A, and the average of A, B and C is 30, then the difference between A and C is:

SSC CPO 23/11/2020 (Shift-02)

(a) 60 (b) 40
(c) 80 (d) 50

185. The average of five positive numbers is 56. If the first number is three-fourth of the sum of the last four numbers, then the average of the last four numbers is:

SSC CGL TIER-II 18/11/2020

(a) 40 (b) 30
(c) 35 (d) 50

186. If the average of a number and its reciprocal is 2, then the average of its cube and its reciprocal is equal to:

SSC CHSL 04/07/2024 (Shift-03)

(a) 28 (b) 26
(c) 48 (d) 36

187. The average of the 4-digit numbers 1244, 2345, 33x3 and 4x38 is 2925. What is the average of (5x + 3) and (9x – 5)?

SSC MTS 27/10/2021 (Shift-02)

(a) 42 (b) 55
(c) 48 (d) 41

188. If A=$\frac{1}{7}$ and B=$\frac{1}{8}$ and the average of A, B and C is $\frac{1}{13}$, then the value of C is:

SSC CHSL 08/08/2023 (Shift-01)

(a) $-\frac{31}{728}$ (b) $-\frac{27}{728}$
(c) $-\frac{89}{728}$ (d) $-\frac{49}{728}$

189. The average of the numbers a, b, c and d is 2d + 4, Also, the average of the numbers a and b ; b and c ; c and d are 8, 5 and 4, respectively. If e = a + d + 1, then what is the average of the numbers d and e?

SSC CHSL 13/04/2021 (Shift-03)

(a) 3 (b) 8
(c) 8.5 (d) 7

190. A library has an average of 265 visitors on Sundays and 130 visitors on other days. The average number of visitors per day in a month of 30 days beginning with a Monday is:

SSC CHSL 19/10/2020 (Shift-03)

(a) 148 (b) 135
(c) 165 (d) 129

191. A public library has an average attendance of 410 on Sundays and 230 for the remaining days. The average attendance per day of a month of 30 days beginning with Sunday would be:

SSC CHSL 10/07/2024 (Shift-03)

(a) 230 (b) 254
(c) 320 (d) 260

192. Three number are such that if the average of any two of them is added to the third number, the sums obtained are 168, 174 and 180 respectively. What is the average of the original three number?

SSC CGL 04/06/2019 (Shift-02)

(a) 86 (b) 87
(c) 89 (d) 84

193. The average weight of a group of 3 people A, B and C is 70 kg. When D joins this group, the average becomes 60 kg. One man E, whose weight is 5 kg more than that of D, replace A and the average weight of B, C, D and E now becomes 59 kg. A's weight (in kg) is:

SSC CPO 23/11/2020 (Shift-02)

(a) 39 (b) 40
(c) 50 (d) 59

194. The average weight of A, B and C is 77 kg. If the average weight of A and B is 68 kg and that of B and C is 83 kg, then the weight (in kg) of B is:

SSC CPO 04/10/2023 (Shift-03)

(a) 71 (b) 74
(c) 67 (d) 73

195. The average of marks obtained by X and Y is 35 less than the average marks obtained by Y and Z. If the marks obtained by Z is 85. what is the marks obtained by X?

SSC CHSL 21/03/2023 (Shift-03)

(a) 155 (b) 15
(c) 35 (d) 25

196. The number of students in section A and section B of a class are 50 and 62, respectively. The average score in mathematics of all the students is 75. If the average score of students in section A is 20% more than that of students in section B, then what is the average score of students in section A (correct to one decimal place)?

SSC CGL TIER-II 29/01/2022

(a) 84.3 (b) 82.6
(c) 87.5 (d) 85.7

197. According to Raghav, his weight is more than 64 kg but less than 74 kg. His sister does not agree with Raghav and she thinks that his weight is more than 60 kg but less than 69 kg. His mother's view is that his weight cannot be more than 68 kg. His father's view is that his weight cannot be more than 67 kg. If all are them are correct in their estimation, then what is the average of different probable weights of Raghav measured (in kg)?

SSC CGL 18/07/2023 (Shift-03)

(a) 66 (b) 67
(c) 68 (d) 65

198. There are 3 groups of persons - male, female and children. There are 20 males and the number of females and children taken together is 4 more than that of the males. The average weight of males is 54 kg, that of females is 49 kg and that of children is 30 kg. If the average weight of the whole group is 48.25 kg, then what is the difference between the number of females and the number of children?

SSC CHSL 10/08/2021 (Shift-01)

(a) 17 (b) 14
(c) 10 (d) 7

199. In an examination, the average score of a student was 67.6. If he would have got 27 more marks in Mathematics, 10 more marks in Computer Science, 18 more marks in History and retained the same marks in other subjects, then his average score would have been 72.6. How many papers were there in the examination?

SSC CGL 23/08/2021 (Shift-01)

(a) 11 (b) 10
(c) 12 (d) 9

200. When 2 is subtracted from each of the given n number, then the sum of the numbers so obtained is 102. When 5 is subtracted from each of them, then the sum of the numbers so obtained is 12. What is the average of the given n numbers?

SSC CGL 09/03/2020 (Shift-02)

(a) 6.2 (b) 5.8

(c) 5.4 (d) 6.6

201. The numbers 2, 3, 4 and 5 occur $(2 + 5k)$, $(5k - 7)$, $(2k - 3)$ and $(k + 2)$ times, respectively. The average of the numbers is 2.85. Later on, the number 2 was replaced by 6 in all the places. What is the average of the new numbers?

SSC CHSL 05/08/2021 (Shift-03)

(a) 2.4 (b) 4.75

(c) 3.85 (d) 5.25

202. The average of x occurring 5 times and y occurring 7 times is 37. Also, the average of x occurring 7 times and y occurring 5 times is 35. The value of $\frac{x}{6}$ is:

Selection post 16/03/2022 (Shift-02)

(a) 8 (b) 5

(c) 4 (d) 6

203. In an examination, average marks of a student per paper were 71. If he would have obtained 35 more marks in sciences; 11 more marks in history and 4 more marks in computer science, his average marks per paper would have been 76. How many papers were there in the examination?

SSC CGL TIER-II 29/01/2022

(a) 15 (b) 12

(c) 18 (d) 10

204. The average weight of 30 persons of group A is 3 kg more than the average weight of 25 persons of group B. The average weight of 25 persons of group B is 2.5 kg more than the average weight of 20 persons of group C. If the total weight of 30 persons of group A is 1725 kg, then what will be the average weight of the persons of group A and group C taken together (in kg)?

SSC CHSL 12/04/2021 (Shift-01)

(a) 55.3 (b) 55.1

(c) 55 (d) 55.4

205. A stock portfolio consists of four stocks. Stock A represents 20% of the portfolio and has a return of 6%. Stock B represents 30% of the portfolio and has a return of 8%. Stock C represents 20% of the portfolio and has a return of 4%. Stock D represents the remaining 30% of the portfolio and has a negative-return of 5%. What is the average return of the portfolio?

SSC CGL 09/09/2024 (Shift-03)

(a) 2.9% (b) 2.6%

(c) 3.2% (d) 3.4%

206. A stock portfolio consists of three stocks. Stock A represents 30% of the portfolio and has a return of 5%. Stock B represents 40% of the portfolio and has a return of 10%. Stock C represents the remaining 30% of the portfolio and has a return of 8%. What is the average return percentage of the portfolio?

SSC Phase XII 26/06/2024 (Shift-03)

(a) 7.2% (b) 7.5%

(c) 8.1% (d) 7.9%

207. The average of 25 integers is zero. What is the maximum possible number of positive integers?

SSC Phase XII 26/06/2024 (Shift-04)

(a) 24 (b) 20

(c) 12 (d) 13

208. The average of 27 numbers is zero. Out of them, how many may be greater than zero, at the most?

SSC CGL 17/06/2019 (Shift-01)

(a) 0 (b) 15

(c) 26 (d) 20

209. In a team of seven members, the average age of six of the members is 42 years while the age of the seventh member of the team is 36 years more than the average age of all the seven members taken together. Find the age (in years) of the seventh member of the team.

SSC CGL 23/09/2024 (Shift-03)

(a) 90 (b) 84

(c) 80 (d) 78

210. The average weight of Rohan and his three friends is 62 kg. If Rohan's weight is 8 kg more than the average weight of his three friends, what is Rohan's weight (in kg)?

SSC Phase XII 25/06/2024 (Shift-03)

(a) 60 (b) 65

(c) 68 (d) 72

211. The average weight of the first thirteen persons among fourteen persons is 78 kg. The weight of the 14th person is 39 kg more than the average weight of all the fourteen persons. Find the weight of the 14th person.

SSC CGL TIER II 26/10/2023

(a) 110 kg

(b) 118 kg

(c) 98 kg

(d) 120 kg

212. 20 Students of a college went to a hotel. 19 of them spent ₹ 175 each on their meal and the 20th student spent ₹ 19 more than the average of all the 20. Find the total money spent by them.

SSC CGL 17/07/2023 (Shift-04)

(a) ₹ 3490

(b) ₹ 3540

(c) ₹ 3520

(d) ₹ 3500

213. Eleven friends spent ₹ 18 each on a tour and the twelfth friend spent ₹11 less than the average expenditure of all twelve of them. What is the total money spent by twelve friends?

SSC MTS 02/05/2023 (Shift-02)

(a) ₹204

(b) ₹215

(c) ₹212

(d) ₹208

214. The average weight of P and his three friends is 55 kg. If P is 4 kg more than the average weight of his three friends, what is P's weight (in kg)?

SSC CGL 11/04/2022 (Shift-01)

(a) 54

(b) 58

(c) 62

(d) 60

215. There are 90 students in a hostel. Due to new admissions, 30 new students join the mess and the daily expenses of the mess increases by ₹ 560, while the average expenditure per head diminishes by ₹ 10. What was the original daily expenditure (in ₹) of the mess?

SSC CHSL 06/08/2021 (Shift-02)

(a) 4,980 (b) 4,280

(c) 5,280 (d) 3,680

216. The average monthly income of A and B is ₹5,050, the average monthly income of B and C is ₹6,250, and the average monthly income of A and C is ₹5,200. What is the sum of the monthly incomes (in ₹) of A, B and C?

SSC Phase XII 25/06/2024 (Shift-03)

(a) 18000

(b) 19500

(c) 16500

(d) 11000

217. There are 75 students in the hostel. Due to new admissions, 15 new students join the mess, and the daily expenses of the mess increased by ₹ 240, while the average expenditure per head diminished by 5. What was the original expenditure (in ₹) of the mess?

SSC MTS 12/09/2023 (Shift-01)

(a) 4,530

(b) 3,450

(c) 4,350

(d) 3,540

218. 8 kg of maize costing Rs.51 per kg, is mixed with 9 kg of maize costing Rs.68 per kg. The average per kg price of mixed maize is:

SSC CGL TIER-II (20/01/2025)

(a) Rs.60

(b) Rs.58

(c) Rs.59

(d) Rs.61

ANSWER KEY

1.	(d)	2.	(a)	3.	(b)	4.	(a)	5.	(d)	6.	(d)	7.	(b)	8.	(d)	9.	(b)	10.	(a)
11.	(c)	12.	(d)	13.	(d)	14.	(b)	15.	(a)	16.	(a)	17.	(a)	18.	(d)	19.	(b)	20.	(c)
21.	(b)	22.	(d)	23.	(a)	24.	(d)	25.	(a)	26.	(d)	27.	(a)	28.	(d)	29.	(b)	30.	(c)
31.	(d)	32.	(a)	33.	(c)	34.	(b)	35.	(b)	36.	(d)	37.	(a)	38.	(c)	39.	(b)	40.	(a)
41.	(d)	42.	(b)	43.	(a)	44.	(d)	45.	(b)	46.	(d)	47.	(b)	48.	(d)	49.	(d)	50.	(d)
51.	(a)	52.	(d)	53.	(a)	54.	(a)	55.	(a)	56.	(d)	57.	(b)	58.	(d)	59.	(d)	60.	(c)
61.	(b)	62.	(c)	63.	(a)	64.	(a)	65.	(b)	66.	(a)	67.	(b)	68.	(c)	69.	(c)	70.	(b)
71.	(d)	72.	(d)	73.	(a)	74.	(b)	75.	(b)	76.	(d)	77.	(b)	78.	(c)	79.	(d)	80.	(d)
81.	(b)	82.	(a)	83.	(d)	84.	(c)	85.	(a)	86.	(d)	87.	(a)	88.	(a)	89.	(d)	90.	(c)
91.	(b)	92.	(a)	93.	(b)	94.	(c)	95.	(c)	96.	(b)	97.	(b)	98.	(a)	99.	(d)	100.	(a)
101.	(b)	102.	(d)	103.	(b)	104.	(b)	105.	(b)	106.	(a)	107.	(c)	108.	(d)	109.	(d)	110.	(a)
111.	(d)	112.	(b)	113.	(a)	114.	(d)	115.	(a)	116.	(d)	117.	(c)	118.	(b)	119.	(d)	120.	(a)
121.	(a)	122.	(d)	123.	(b)	124.	(c)	125.	(b)	126.	(b)	127.	(c)	128.	(d)	129.	(d)	130.	(d)
131.	(c)	132.	(a)	133.	(c)	134.	(c)	135.	(a)	136.	(a)	137.	(c)	138.	(b)	139.	(b)	140.	(a)
141.	(a)	142.	(c)	143.	(c)	144.	(b)	145.	(c)	146.	(b)	147.	(b)	148.	(a)	149.	(a)	150.	(d)
151.	(b)	152.	(d)	153.	(c)	154.	(d)	155.	(a)	156.	(b)	157.	(d)	158.	(a)	159.	(c)	160.	(a)
161.	(b)	162.	(a)	163.	(a)	164.	(d)	165.	(c)	166.	(d)	167.	(c)	168.	(b)	169.	(a)	170.	(b)
171.	(c)	172.	(b)	173.	(b)	174.	(c)	175.	(a)	176.	(d)	177.	(d)	178.	(d)	179.	(d)	180.	(d)
181.	(b)	182.	(b)	183.	(a)	184.	(d)	185.	(a)	186.	(b)	187.	(c)	188.	(b)	189.	(b)	190.	(a)
191.	(d)	192.	(b)	193.	(a)	194.	(a)	195.	(b)	196.	(b)	197.	(a)	198.	(c)	199.	(a)	200.	(c)
201.	(d)	202.	(b)	203.	(d)	204.	(a)	205.	(a)	206.	(d)	207.	(a)	208.	(c)	209.	(b)	210.	(c)
211.	(d)	212.	(c)	213.	(a)	214.	(b)	215.	(c)	216.	(c)	217.	(b)	218.	(a)				

SOLUTIONS

1. (d)

Friends →	1st	2nd	3rd	4th	5th
Weight →	67	85	70	90	103
Deviation →	−3	+15	0	+20	+33

68 − 3 = 65

Let, Avg. = 70

$$\text{Deviation} = \frac{65}{5} = 13$$

∴ Original avg. 70 + 13 = 83

2. (a) Average weight

$$= \frac{(1500+1250+1350+750+950+700+400+500)}{8}$$

$$= \frac{7400}{8} = 925 \text{ gm.}$$

Alternate Method:

Let, Average = 950

1500 1250 1350 750 950 700 400 500

950 → Avg.

+550 +300 +400 −200 0 −250 −550 −450

$$\text{Avg.} = 950 + \frac{(1250-1450)}{8} = 950 - \frac{200}{8}$$

$= 950 - 25 = 925$ gm.

3. (b) Avg. Salary

$$= \frac{12000\times3+15000\times3+21000\times3+30000\times3}{12}$$

$$= \frac{36000+45000+63000+90000}{12}$$

$$= \frac{234000}{12} = 19500$$

Alternate Method:

Let, Avg. Salary = 20,000

By deviation method

$$20000 + \frac{[(-8000)\times3+(-5000)\times3+(1000)\times3+(10000)\times3]}{12}$$

$$= 20000 + \frac{[-24000-15000+3000+30,000]}{12}$$

$$= 20,000 + \frac{(-6000)}{12} = 20,000 - 500$$

= 19500.

4. (a) Let, Average = 55 kg

Weight	52.7	54	55.2	57.4	58.7	58	
	−2.3	−1	+0.2	+2.4	+3.7	+3	= 6
Average	55	55	55	55	55	55	

$$\therefore \text{New avg.} = 55 + \frac{6}{6} = 55 + 1 = 56 \text{ kg}$$

5. (d) ATQ,

$$\frac{20+25+(p+1)+(2p+5)+(p+11)}{5} = 22$$

$\Rightarrow 4p + 62 = 110$

$\Rightarrow 4p = 48 \Rightarrow p = 12$

6. (d) Average of $3^{20}, 3^{30}$ and 3^{40}

$$= \frac{3^{20} + 3^{30} + 3^{40}}{3} = \frac{3(3^{19} + 3^{29} + 3^{39})}{3}$$

$= (3^{19} + 3^{29} + 3^{39})$

7. (b) Total sum of 6 day (Monday _ Saturday)

= 8000 × 6 = 48000 ₹

Sum of five days

= 7230 + 6435 + 6927 + 6855 + 6562

= ₹ 34009

Saturday = 48000 − 34009 = ₹ 13,991

Alternate Method:

7230 6435 6855 6927 6562

Avg. 8000

+770 +1565 +1145 +1073 +1438

Saturday = 8000 + 770 + 1565 + 1145 + 1073 + 1438 = 13991

SMART APPROACH:-

In this question, Monday to Friday donations are less than 8000, so Saturday donation must be greater than 8000.

Only option (b) is greaterthan 8000.

8. (d) Average cost

$$= \frac{4\times50+5\times60+6\times70}{15}$$

$$= \frac{200+300+420}{15} = \frac{920}{15} = ₹61.33$$

Alternate Method:

50 ₹ 60 ₹ 70 ₹

$\boxed{4 \text{ Book}}$ $\boxed{5 \text{ Book}}$ $\boxed{6 \text{ Book}}$ = 60 (Let)

$-10\times4 = -40$ ↓ 0 $+10\times6$ +60

Avg = 60 + 1.33 = 61.33 ₹

$\frac{+20}{15} = 1.33$

9. (b)

Day → 25 : 2 : 3

Average → 5000 : 20000 : 1500

Let, Avg. = 5000

Net deviation = (15000 × 2) – (5000 – 1500) × 3 = 30000 – 10500 = 19500

Original average = 5000 + $\frac{19500}{30}$

= 5000 + 650 = 5650

10. (a) Average Monthly income

$= \frac{\text{Total Exp.} + \text{Saving}}{12}$

$= \frac{(2500\times4)+(2750\times5)+(3550\times3)+5500}{12}$

$= \frac{10000+13750+10650+5500}{12}$

$= \frac{39900}{12} = 3325$

Alternate Method:

2500 2750 3550

Month → 4 5 3

Let, Avg. = 2500

Net deviation

$= \frac{0\times4+250\times5+1050\times3+5500}{12}$

$= \frac{1250+3150+5500}{12} = \frac{9900}{12} = 825$

∴ Average monthly income

= 2500 + 825 = 3325

11. (c)

	Theory	Practical
Subject A →	110	40
Subject B →	40	60
R get →	60 × 2 = 120	40 × 2 = 80

Total marks R got = 200

∴ Average marks per subject

$= \frac{200}{2} = 100$

12. (d) Data → 10 10 x

Avg. → 8 5 4

80 + 50 + 4x = 150 ⇒ x = 5

∴ Average = $\frac{150}{10+10+5}$ = ₹6

13. (d) ATQ,

Required average

$= \frac{15500+12500+(7000\times2)}{7} = 6000$

14. (b) A + B = 2 × 7000 = 14000

B + C = 2 × 7750 = 15500

A + C = 2 × 6750 = 13500

A + B + C = 21500

B = 21500 – 13500 = ₹8000

15. (a) Total expenditure = (2300 × 4 + 1800 × 8) = (9200 + 14400) = 23600

Total savings = (12,400)

Income = (expenditure + saving)

= (23600 + 12400) = 36000

Monthly income = $\frac{36000}{12}$ = 3000

Alternate Method:

	4	:	8
Data →	1	:	2
Avg. →	2300		1800

Avg. exp. = 1800 + $\frac{500\times1}{3} = \frac{5900}{3}$

Avg. income = $\frac{5900}{3} + \frac{12400}{12}$

$= \frac{23600+12400}{12} = \frac{36000}{12} = 3000$

16. (a) Extra marks than avg.

= 56 – 51 = 5

New avg. = $51 + \frac{5}{5} = 52$

17. (a) Sum of s numbers = s × r^4

Sum of r numbers = r × s^4

Average of (r + s) numbers

$= \frac{rs\left(r^3+s^3\right)}{(r+s)} = rs(r^2 - rs + s^2)$

18. (d) Average of Hindi marks

$= \frac{11\times78+7\times80+5\times82+2\times86}{11+7+5+2}$

$= \frac{858+560+410+172}{25} = \frac{2000}{25} = 80$

Alternate Method:

Students →	11	7	5	2
Marks →	78	80	82	86
Deviation →	–2	0	+2	+6

Let, Overall avg. 80

Total deviation = – 22 + 0 + 10 + 12 = 0

Net avg. = 80

19. (b) Sale on 5th day

=(6050×5)–(5445+5937+5865 + 6562)

= (30,250 – 23809) = ₹6441

Alternate Method:

Let, Avg. = 6050

5445 5937 5865 6562

Avg. 6050

+605 +113 +185 –512 = 391

Sale on 5th day = 6050 + 391

= 6441

20. (c) 11th Result = 59 × 11 – 58 ×10

= 649 – 580 = 69

Alternate Method:

Number	Average
11	59
10	58

$\}-1$

Net deviation = –1 × 10 = –10

∴ 11th Number = 59 + 10 = 69

21. (b) Sum of five integers = 48 × 5 = 240

	Ist four integer	:	5th integers
Ave →	1	:	2
Sum →	1 × 4	:	2
Sum →	2	:	1

Sum of five integer (3 unit) = 240

5th integer (1 unit) = 80

22. (d)

10000 7500 8000 10500 5th

1000 –1500 –1000 +1500 x

9000

Deviation = 0

then x = 9000

23. (a) If any number, multiplied, divided, addition and subtraction by number. The average of those number will change by same number.

So,

New average = 13 × 23 = 299

24. (d) If any number multiplied divided addition and subtraction by number. The average of those number will change by same number. So answer will be (d) (M – 100)

25. (a) Average of 12 numbers = 25

Sum of 12 numbers = 25 × 12 = 300

New sum of 12 numbers = 300 + 12 × 6 = 372

New average of 12 numbers

$= \frac{372}{12} = 31$

Alternate Method:

Average of 12 numbers = 25

When 6 is added to each number it means all numbers increase by 6 so average also increases by 6.

So, new average of 12 numbers = 25 + 6 = 31

26. (d) Let, n = 10, Avg = 45

ATQ,

6 × 5 = +30

4 × (–10) = – 40

New Avg = 45 + $\frac{(30-40)}{10}$

= 45 – 1 = 44

Alternate Method:

60% = $\frac{3}{5_{(\text{no.})}}$

3 2

↓ ↓

+5 –10

Deviation = $\frac{+15-20}{(3+2)} = \frac{-5}{5} = -1$

New Average = 45 – 1 = 44

27. (a) Ten consecutive odd no.s = 5, 7, 9, 11, 13, 15, 17, 19, 21, 23,

Multiply each by 3 except first and second = 5, 7, 27, 33, 39, 45, 51, 57, 63, 69

Now average of 10 numbers = $\frac{396}{10}$

= 39.6

28. (d) Avg. → 4

No. → — — — — — —

Avg.→ 3.5 Avg.→ 3.75

Deviation → (–0.5) + (–0.5) +(–0.25) + (–0.25)

$\underbrace{\qquad}_{-1.5}$

∴ Required average of remaining 2 number = 4 + $\frac{1.5}{2}$ = 4 + 0.75 = 4.75

Alternate Method:-

Required average of remaining 2 number

$= \frac{4\times6-(2\times3.5)-(2\times3.75)}{2}$

$= \frac{24-7-7.5}{2} = \frac{9.5}{2} = 4.75$

29. (b) A.T.Q.

No. → 5 : 5 : 20

Avg. → 10 14 x

-2 2

$\overline{\quad\quad\quad}$ 12

$-10+10=0$ $\therefore x = 12$ years

Alternate Method:-

Let, Avg. of remaining students = x

ATQ,

$5\times10+5\times14+x\times20=30\times12$

$\Rightarrow 120+20x=360 \Rightarrow x=12$

30. (c) W_i = weight , x_i = numbers

Weighted average = $\dfrac{\sum w_i x_i}{\sum w_i}$

$=\dfrac{1\times1+2\times2+3\times3+....+(n\times n)}{1+2+3+....+n}$

$=\dfrac{1^2+2^2+3^2+....+n^2}{1+2+3+....+n}$

$=\dfrac{\frac{n(n+1)(2n+1)}{6}}{\frac{n(n+1)}{2}}=\dfrac{2n+1}{3}$

31. (d) Weight → 6 : 5 : 8

Profit → 50000 20000 10000

Weighted Average of profit

$=\dfrac{300000+100000+80000}{19}$

$=\dfrac{480000}{19}=25263.16$ (Approx)

Alternate Method:

Let, Avg. = 10000

Weight → 6 : 5 : 8

Profit → 50000 : 20000 : 10000

Deviation = $\dfrac{40000\times6+10000\times5}{6+5+8}$

$=\dfrac{290000}{19}=15263.16$

Avg. = 10000 + 15263.16 = 25263.16

32. (a)

	Weightage	Marks
Physics	2	8
Chemistry	3	8
Biology	3	6
Interview	4	6.5

Weighted average

$=\dfrac{(2\times8)+(3\times8)+(6\times3)+(6.5\times4)}{12}$

$=\dfrac{84}{12}=7$

33. (c) Average of first 'n' natural number = $\dfrac{n+1}{2}=\dfrac{10+1}{2}=5.5$

34. (b) Average of first 69 Natural numbers = $\dfrac{\text{First term + last term}}{2}$

$=\dfrac{1+69}{2}=35$

Alternate Method:

Avg. of natural number = $\dfrac{n+1}{2}$

$=\dfrac{69+1}{2}=35$

35. (b) Avg. of first n natural number = $\dfrac{n+1}{2}$

$\therefore$ Avg. of first 125 natural no.

$=\dfrac{125+1}{2}=\dfrac{126}{2}=63$

36. (d) Average of first 'n' natural number

$=\dfrac{n+1}{2}=\dfrac{69+1}{2}=35$

37. (a) Natural number 1 to 73 = 1, 2, 3, ...,73

Average = $\dfrac{1+73}{2}=37$

38. (c) Avg. of square of first n natural number = $\dfrac{(n+1)(2n+1)}{6}$

$\therefore$ Avg. of square of first 45 natural number

$=\dfrac{(45+1)(90+1)}{6}=\dfrac{46\times91}{6}=\dfrac{23\times91}{3}$

= 697.67

39. (b) The average of square of n natural no. = $\dfrac{(n+1)(2n+1)}{6}$

Average of square of 46 natural no.

$=\dfrac{(47\times93)}{6}=728.5$

Note:- Use digital sum method to avoid calculation

40. (a) Average of Square of N natural no.

$=\dfrac{(n+1)(2n+1)}{6}$

Average of Square of 47 natural no

$=\dfrac{(47+1)(2\times47+1)}{6}=\dfrac{48\times95}{6}$

$=95\times8=760$

Note:- Use unit digit method to avoid calculation

41. (d) Average of square of first n natural No. = $\dfrac{(n+1)(2n+1)}{6}$

Avg. of square of first 48 natural No.

$=\dfrac{49\times97}{6}=\dfrac{4753}{6}=792.17$

42. (b) Average of square of even numbers = $\dfrac{2}{3}(n+1)(2n+1)$

$\because n=5$

Average of square of first five even numbers = $\dfrac{2}{3}\times6\times11=44$

43. (a) Average of first n even number = (n + 1)

⇒ Average of first 91 even number = 91 + 1 = 92

44. (d) Average of first n even number = (n + 1)

Average of first 92 even number = 92 + 1 = 93

45. (b) Avg. of 10 consecutive no.

$=\dfrac{33}{2}=16.5$

10 consecutive No. = 12, 13, 14, 15, 16, 16.5, 17, 18, 19, 20, 21

First three no. = 12, 13, 14

$\therefore$ Avg. of first three no. = 13

46. (d) If average of 10 consecutive number is 13.5 then the 5th and 6 number will be 13 and 14

$\underline{9}\ \underline{10}\ \underline{11}\ \underline{12}\ 13,14\ \underline{15}\ \underline{16}\ \underline{17}\ \underline{18}$

Sum of first 6 number = 9 + 10 + 11 + 12 + 13 + 14 = 69

47. (b) 30 32 33 34 36

a b Avg. c d

$|bd-ac| = 32\times36-30\times34$

$=12\,[96-85]=12\times11=132$

48. (d) If we let Numbers –

2, 4, $\underline{6}$, 8, 10

Average(A) = 6

If we Include Next 5 even consecutive Number.

2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Average = $\dfrac{20+2}{2}=11$

So, new avg. = A + 5

Alternate Method:

$\_\_\ \_\_\ \underline{A}\ \underline{A+2}\ \underline{A+4}\,|\,\underline{A+6}\ \_\_\ \_\_\ \_\_\ \_\_$

New average = $\dfrac{A+4+A+6}{2}=A+5$

49. (d) Sum of first 148 even numbers

$=148(148+1)=148\times149$

⇒ Average = 149

Sum of first 129 odd numbers

$=129\times129$

⇒ Average = 129

⇒ Difference = 149 – 129 = 20

Alternate Method:

Avg. of first 148 even no. = 148 + 1 = 149

Avg. of first 129 odd no. = 129

diff. = 149 – 129 = 20

50. (d) $\sqrt{233} > 15$

So, No. are 11, 13, 15, 17, 19

Avg. of largest and smallest no.

$=\dfrac{19+11}{2}=15$

51. (a) If we remove 2 no. from last then avg. move 1 place to left.

Then new avg. = (d – 1)

52. (d) If next and previous no. is included. Then average remains same.

53. (a) In case of consecutive even numbers, if the numbers increase by 'n' then average also increases by 'n'. here no. increases by 5 so new average = M + 5.

54. (a) 5 consecutive odd number

$x, x+2, x+4, x+6, x+8$

$\dfrac{5x+20}{5}=m \Rightarrow x+4=m$

⇒ After adding 3 odd no's

$\dfrac{5x+20+x+10+x+12+x+14}{8}$

$=\dfrac{8x+56}{8}=x+7$

$\therefore$ Increase in average

$=x+7-(x+4)=3$

SMART APPROACH:-

In consecutive number Trick-

If number increases by "n"

then average also increases by "n".

$\therefore$ average must be increases by 3

55. (a) _ _ _ A _ _ _
If 2 number add from next and before then the average will be same but 1 extra number added to next then average will be (A + 1)

56. (d) If we remove first 10 numbers and add next 10 number then average will be (N + 10) = M
Now
$M^2 - N^2 = 600$
$\Rightarrow (M + N)(M - N) = 600$
$\Rightarrow (2N + 10)(10) = 600$
$\Rightarrow N = 25,\ M = 35$
$\therefore \frac{3M + 5N}{2} = \frac{105 + 125}{2} = 115$

57. (b) Avg. $= \frac{2+3+5+7+11+13}{6}$
$= \frac{41}{6} = 6\frac{5}{6}$

58. (d) Prime number between 50 and 76 = 53, 59, 61, 67, 71, 73.
$\therefore$ Average $= \frac{53+59+61+67+71+73}{6}$
= 64

Alternate Method:-
53, 59, 61, 67, 71, 73
Avg. = 60
–7 –1 +1 +7 +11 +13
Avg. $= 60 + \frac{(32-8)}{6} = 60 + \frac{24}{6} = 64$

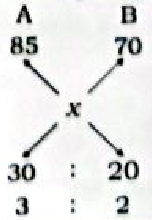
59. (d) First 8 prime numbers = 2, 3, 5, 7, 11, 13, 17, 19
Average
$= \frac{2+3+5+7+11+13+17+19}{8} = \frac{77}{8}$
Average of first to 10 even natural number = (10 +1) = 11
Ratio $= \frac{77}{8} : 11 = 7 : 8$

60. (c)
Quantity → 2 : 3
Price → 30 : 50
Total price → 60 : 150
Avg. $= \frac{60+150}{2+3} = \frac{210}{5} =$ ₹42/kg

61. (b) Let, Average of 45 matches = x
ATQ,
$(15 \times 20) + (24 \times 25) = x \times 45$
$\Rightarrow x = \frac{300+600}{45} = \frac{900}{45} = 20$

Alternate Method:-
Let, Average = 20.
Avg. $= 20 + \frac{(-5\times20)+(4\times25)}{45}$
$= 20 + \frac{(-100+100)}{45} = 20$

62. (c) Solve by Alligation method,



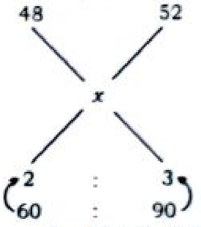
Now,
x(Average score) $= \frac{85\times3+70\times2}{3+2}$
$\Rightarrow x = \frac{255+140}{5} \Rightarrow x = \frac{395}{5} = 79$

Alternate Method:
30 : 20
Data → 3 : 2
Avg. → 85 70

$\frac{+15\times3}{5} = 9$
$\therefore$ Avg. of whole class = 70 + 9 = 79

63. (a) Let, Avg. = 48
Girls Boys
No. → 60 90
Avg. → 48 52
Net deviation $= \frac{0\times48+4\times90}{150} = 2.4$
$\therefore$ Avg. = 48 + 2.4 = 50.4

Alternate Method:
Let, Avg. score of class = x



$x = \frac{3\times52+2\times48}{5} = \frac{252}{5} = 50.4$

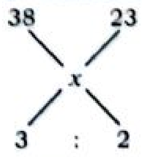
64. (a) Apple → $\frac{40}{5}$ $\frac{32}{4}$
$\downarrow \times33$ $\downarrow \times60$
Avg. → $\frac{165 + 240}{9}$
$\therefore$ Avg. $= \frac{405}{9} = 45$ kg.

Alternate Method:-
Average weight
$= 40 + \frac{(-7\times40+20\times32)}{72}$
$= 40 + \frac{(-280+640)}{72} = 40 + \frac{360}{72}$
= 40 + 5 = 45

65. (b) Total amount = 10 × 94.5 + 5 × 105
= 945 + 525 = ₹1470
$\therefore$ Average $= \frac{1470}{15} =$ ₹98

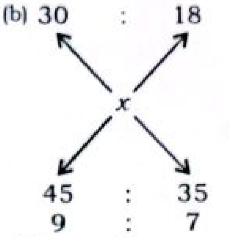
66. (a) ATQ,
$\Rightarrow$ Average $= \frac{3\times38+2\times23}{5}$
$= \frac{114+46}{5} = \frac{160}{5} = 32$

Alternate Method:



$\Rightarrow \frac{38-x}{x-23} = \frac{2}{3}$
$\Rightarrow 114 - 3x = 2x - 46$
$\Rightarrow x = \frac{160}{5} = 32$

67. (b)



$\frac{30-x}{x-18} = \frac{7}{9} \Rightarrow 270 - 9x = 7x - 126$
$\Rightarrow 16x = 396 \Rightarrow x = 24.75$

Alternate Method:
Data → 45 35
Average → 30 18

Let, average → 25
Net deviation $= \frac{45\times5-35\times7}{45+35}$
$= \frac{-20}{80} = -0.25$
Average marks of whole class
= 25 – 0.25 = 24.75

68. (c) Let, Avg. = 3300
32 : 40
Data → 4 : 5
Avg. → 6000 3300
Net $= \frac{2700\times4}{9} = 1200$
$\therefore$ Avg. of whole group = 3300 + 1200 = 4500

69. (c)
No → $\frac{A}{1}$: $\frac{B}{2}$
Average weight → 12 kg 24 kg
$\therefore$ Avg. of both groups $= \frac{12+48}{3} = 20$

70. (b)
Mathematic English Hindi
Number → 3 : 2 : 2
Average → 45 55 60
45
Overall Average
$= 45 + \frac{10\times2+15\times2}{7} = 52.1$

71. (d) ATQ,
Required average
$= \frac{(55\times50)+(60\times55)+(45\times60)}{55+60+45}$
$= \frac{2750+3300+2700}{160} = 54.68$

Alternate Method:
Batch student → 55 60 45
11 : 12 : 9
Average → 50 55 60
0 +5 +10
Let, Overall avg. → 50
Average $= 50 + \frac{(60+90)}{32} = 54.68$

72. (d) Boys Girls

89 91 → (+2)

x

0.84

29 + 21 → 50

⇒ 50 unit → 2

⇒ 1 unit → $\frac{1}{25}$ = 0.04

⇒ 21 unit → 0.84

⇒ $x - 89 = 0.84$ ⇒ $x = 89.84$

Alternate Method:

Let, Avg. = 89

B : G

Data → 29 : 21

Avg. → 89 : 91

Net deviation = + 2 × 21 = + 42

Avg. of while class = 89 + $\frac{42}{29+21}$

= 89 + 0.84 = 89.84

73. (a) $\boxed{\text{12 Student}}$ $\boxed{\text{18 Student}}$ = 30

62 62

Average of 30 student

$= \frac{12 \times 62 + 18 \times 62}{30}$

$= \frac{62 \times 30}{30} = 62$

> **SMART APPROACH:-**
>
> Avg. of 12 students and 18 students is equal. So, avg. of whole group will be same.
>
> ∴ Avg. = 62

74. (b) Let, Average score = x

ATQ,

$\Rightarrow \frac{12 \times 62 + 74 \times 18}{30} = x$

$\Rightarrow \frac{744 + 1332}{30} = x$

$\Rightarrow \frac{2076}{30} = x \Rightarrow 69.2 = x$

∴ Average score = 69.2

Alternate Method:

Students → 12 : 18

Avg. → 62 : 74

Let Avg. = 62

Net deviation = $\frac{(74-62) \times 18}{30} = \frac{216}{30}$

= 7.2

∴ Avg. = 62 + 7.2 = 69.2

Alternate Method:

Total number → 30

Student → 12 18

2 3

↓×62 ↓×74

Average → $\frac{124 + 222}{5}$

$= \frac{346}{5} = 69.2$

75. (b) No. → 12 : 18

2 : 3

Avg. → 62 : 72

Let, Avg. = 62

Net deviation = $\frac{(72-62) \times 3}{5} = 6$

∴ Average score = 62 + 6 = 68

76. (d) 62 76

x

12 : 18

2 : 3

ATQ,

$\frac{76 - x}{x - 62} = \frac{2}{3}$

⇒ $228 - 3x = 2x - 124$

⇒ $5x = 352$ ⇒ $x = 70.4$

Alternate Method:

No. → 12 : 18

Avg → 62 : 76

Let, Avg. = 62

Net deviation = $\frac{(76-62) \times 18}{30} = 8.4$

∴ Average score = 62 + 8.4 = 70.4

77. (b) No. → 12 18

Avg. → 62 68

Let, Avg. of whole class = 62

Net deviation = $\frac{(68-62) \times 18}{30} = 3.6$

∴ Avg. score of whole class = 62 + 3.6 = 65.6

Alternate Method:

62 68

x

12 18

2 : 3

$\Rightarrow \frac{68 - x}{x - 62} = \frac{2}{3}$

⇒ $5x = 68 \times 3 + 62 \times 2$

$\Rightarrow x = \frac{68 \times 3 + 62 \times 2}{5} = 65.6$

78. (c) No. → 12 18

Avg. → 62 60

Let, Avg. of whole class = 62

Net deviation = $\frac{0 \times 12 - 2 \times 18}{30} = -1.2$

∴ Avg. score of whole class

= 62 − 1.2 = 60.8

Alternate Method:-

(Total students)

30

12 18

2 : 3

Avg. → ↓62 : ↓60

New Avg. = $\frac{124 + 180}{5} = \frac{304}{5} = 60.8$

79. (d)

30

No. → 12 18

Avg. → 62 78

Let, Avg. of whole class = 62

Net deviation = $\frac{0 \times 12 + 16 \times 18}{30}$ = +9

∴ Avg. score of whole class = 62 9.6 = 71.6

Alternate Method:-

(Total students)

30

Students → 12 18

2 : 3

Avg. → ↓62 ↓78

New Avg. $\frac{124 + 234}{5} = \frac{358}{5} = 71.6$

Alternate Method:-

Let, Avg. score of class = x

62 78

x

2 : 3

12 : 18

$x = 62 + \frac{(78-62)}{5} \times 3$

$x = 62 + 9.6 = 71.6$

80. (d) No. → 12 : 18

Avg. → 60 : 80

Let, Avg. = 60

Net deviation = $\frac{20 \times 18}{30} = 12$

∴ Avg. = 60 + 12 = 72

Alternate Method:

30

Student → 12 18

2 : 3

↓×60 ↓×80

New avg. → $\frac{120 + 240}{5} = \frac{360}{5} = 72$

81. (b) Average score = $\frac{10 \times 90 + 75 \times 20}{30}$

$= \frac{900 + 1500}{30} = \frac{2400}{30} = 80$

Alternate Method:-

Students → 10 : 20

Avg. → 90 : 75

Let, Avg. = 75

Net deviation = $\frac{15 \times 10}{30} = 5$

∴ Avg. = 75 + 5 = 80

82. (a)

Student → 15 10

3 2

↓×80 ↓×60

New avg. → $\frac{240 + 120}{5} = \frac{360}{5} = 72$

83. (d)

Total No. of students → ⑦②

B G

40 32

5 4

↓×33 ↓×15

165 60

∴ Average = $\frac{165 + 60}{9} = \frac{225}{9} = 25$

84. (c) Student → 50 150

$$\begin{array}{lcc} & 1 & 3 \\ \text{Marks} \rightarrow & \downarrow \times 40 & \downarrow \times 60 \end{array}$$

New avg. → $\frac{40 + 180}{4}$

$= \frac{220}{4} = 55$

Alternate Method:-

Let, Average = 100

By deviation method:

Average =

$100 + \frac{(-60 \times 50 - 40 \times 150)}{200}$

$= 100 + \frac{(-3000 - 6000)}{200}$

$= 100 - \frac{9000}{200} = 100 - 45 = 55$

85. (a) Using deviation method:

Overall average score

$= 62 + \frac{(75-62) \times 18}{40} = 62 + \frac{234}{40}$

$= 67.85$

Alternate Method:

Let, Avg. = 62

18 : 22

Data → 9 : 11

Avg. → 75 62

Deviation $= \frac{+13 \times 9}{20} = \frac{117}{20} = 5.85$

∴ Avg. of whole class = 62 + 5.85 = 67.85

86. (d) Average rate of pass percentage =

$\frac{75 \times 84\% + 50 \times 52\%}{75+50}$

$= \frac{63+26}{125} \times 100\% = \frac{89 \times 4}{5}\% = 71\frac{1}{5}\%$

Alternate Method:

Exm₁ Exm₂

$$\begin{array}{cc} 75 & 50 \\ \downarrow \times 4 & \downarrow \times 4 \\ 300 & 200 \\ \downarrow \times 84\% & \downarrow \times 52\% \\ 252 & 104 \end{array}$$

→ Multiply by 4 to aviod calculation

Required% $= \frac{252+104}{500} \times 100$

$= 71\frac{1}{5}\%$

87. (a) 40% 60%

Male Female

168 162

x

$x - 162$: $168 - x$

$\therefore \frac{x-162}{168-x} = \frac{2}{3}$

$\Rightarrow 3x - 486 = 336 - 2x$

$\Rightarrow 5x = 822 \Rightarrow x = 164.4$

Alternate Method:

Female : Male

60% : 40%

3 : 2

162 : 168

$\big) + 6$

$\Rightarrow 162 + \frac{2 \times 6}{3+2} = 162 + 2.4 = 164.4$

88. (a) Current age of newly joined workers = 37 + (37 – 35.5) × 12

= 37 + 18 = 55 yrs.

Alternate Method:

Current age of newly joined workers

= 35.5 + (37 – 35.5) × 13

= 35.5 + 19.5 = 55 yrs.

89. (d) Weight of teacher

$= \text{New Avg} + 40 \times \frac{500}{1000}$

= (52.5 + 20) kg = 72.5 kg.

Alternate Method:

Weight of teacher $= 52 + \frac{500}{1000} \times 41$

= 52 + 20.5 = 72.5 kg.

90. (c) Weight of new member

= 60 – 1 × 21 = 60 – 21 = 39 kg

91. (b) ATQ,

$5 \times 175 + x = 6 \times 176$

$\Rightarrow x = 1056 - 875 \Rightarrow x = 181$ cm

Alternate Method:

Height of sixth boy = 175 + 1 × 6

= 175 + 6 = 181

92. (a) Weight of teacher = 70 + 0.5 × 33

= 70 + 16.5 = 86.5 kg

93. (b) Weight of teacher = 60 + (31 × 0.5) = 75.5 kg

94. (c) Let, Difference of average weights = x kg

$78 = 30 + x \times 16$

$\Rightarrow x = 3$

Average weight of 16 Persons

= 30 + 3 = 33 kg

Alternate Method:

Avg. weight of 16 persons

$= 30 + \frac{(78-30)}{16} = 30 + 3 = 33$ kg.

95. (c) Age of coach = Old Avg. + 13 × 2

= 24 + 26 = 50 yrs.

96. (b) Let, Students = x

$58.4 \times x + 5 \times 62.8 = (58.4 + 0.55) \times (x + 5)$

$\Rightarrow 58.4x + 314 = 58.95x + 294.75$

$\Rightarrow 0.55x = 19.25$

$\Rightarrow x = 35$

Alternate Method:

Total deviation = 5 × 4.4 = +22

No. of students now $= \frac{22}{0.55} = 40$

∴ Initially no. of students = 40 – 5 = 35

97. (b) Let, Average = 70

Weight → 65 kg. 68 kg. 45 kg. 77 kg. 62 kg.

Deviation → (–5) + (–2) + (–25) + (+7) + (–8) = –33

⇒ Total no. of students= 15 + 5 = 20

∴ Weight distribution$= \frac{-33}{20}$

=1.65 kg. = 2 kg.

∴ Average weight decreases by 2 kg.

Alternate Method:

Total weight of all 15 student

= 15 × 70 = 1050 kg

Total weight of 20 student = 1050 + 65 + 68 +45 + 77 + 62

= 1050 + 317 = 1367

Average of 20 students $= \frac{1367}{20} = 68.35$

∴Diff = 70 – 68.35 = 1.65 kg ≈ 2 kg

98 (a) Avg. weight of 16 students

$= \frac{8 \times 48 + 4 \times 44 + 4 \times 58}{16}$

$= \frac{384 + 176 + 232}{16} = \frac{792}{16} = 49.5$

Alternate Method:

Let, Avg = 44

Data → 8 4 4

Avg. → 48 44 58

(4 × 8) 0 (4 × 14)

Deviation $= \frac{32 + 56}{16} = \frac{88}{16} = 5.5$

Avg. = 44 + 5.5 = 49.5

99. (d) Let, no. of students at present = x

ATQ,

$(60 - 55.5) \times 4 = x \times 360$ gm.

$\Rightarrow 4.5 \times 4 = \frac{360x}{1000}$

$\Rightarrow x = \frac{18000}{360} \Rightarrow x = 50$

Initially no. of students = 50 – 4 = 46

100. (a) Let, No. of students = n

Initial average = x

Total weight of students = nx

Case I:

$\frac{nx + 30}{n + 1} = x + 1$

$\Rightarrow nx + 30 = nx + x + n + 1$

$\Rightarrow x + n = 29$ ......(i)

Case II:

$\frac{nx + 30 + 30}{n + 2} = x + 1.5$

$\Rightarrow nx + 60 = nx + 2x + 1.5n + 3$

$\Rightarrow 2x + 1.5n = 57$ .....(ii)

From (i) and (ii),

57 = 2(29 – n) + 1.5n

⇒ 57 = 58 – 2n + 1.5n

⇒ – 1 = – 0.5n ⇒ n = 2

From eqn. (i),

$x + n = 29 \Rightarrow x = 27$

∴ Original avg. weight of class = 27kg.

Alternate Method:

Let, total no. of students initially be n.

Case I: Original Avg. = 30 – 1(n + 1) ......(i)

Case II: 1 + Original Avg. $= 30 - \frac{1}{2}$ (n + 2)

⇒ Original Avg. $= 30 - \frac{1}{2}(n + 2) - 1$ .....(ii)

From eqn. (i) and (ii),

$30 - (n + 1) = 30 - \frac{1}{2}(n + 2) - 1$

⇒ n = 2

∴ Original Avg. = 30 – (2 + 1) = 27kg.

101. (b) Let, Average weight of 6 students = x kg.

$\frac{20 \times 30.5 + 6x}{(20 + 6)} = (30.5 + 2)$

$\Rightarrow 610 + 6x = 845$

$\Rightarrow 6x = 235 \Rightarrow x = 39.2$ kg

Alternate Method:

Average weight of 6 students

$= 30.5 + \frac{(26 \times 2)}{6}$

= 30.5 + 8.7 = 39.2 kg

102. (d) Let, Boys in class initially = x
ATQ,
$$\frac{x \times 16 + 4 \times 13}{(x+4)} = (16 - 0.5)$$
$\Rightarrow 16x + 52 = 15.5x + 62$
$\Rightarrow 0.5x = 10 \Rightarrow x = 20$

Alternate Method:
Let, Number of student after add 4 students = x
$$16 - 13 = \frac{0.5}{4} \times x$$
$$\Rightarrow \frac{0.5x}{4} = 3 \Rightarrow x = 24$$
No. of Students in class initially
= 24 – 4 = 20

103. (b) Let, Total number of people = x.
ATQ,
$$\frac{x \times 27 + 4 \times 25}{x+4} = 26$$
$\Rightarrow 27x + 100 = 26x + 104 \Rightarrow x = 4$

SMART APPROACH:-
Number of people initially
$$= \frac{(27-26) \times 4}{26-25} = \frac{4 \times 1}{1} = 4$$

104. (b) Average of (A and B) = $55 - \frac{5 \times 5}{2}$
= 55 – 12.5 = 42.5
A + B = 42.5 × 2 = 85
B – A = 15
$$A = \frac{85-15}{2} = 35$$

105. (b) Total age of 6 girls = x
Total age of 10 girls = $6x + x - 2 + x + 4 + x + 8 + x + 10 = 10x + 20$
$$\text{Avg. age of 10 girls} = \frac{10x + 20}{10}$$
$= x + 2$

Alternate Method:
Let, Avg. = x

Data →	6	1	1	1	1
Avg. →	x	$x-2$	$x+4$	$x+8$	$x+10$
		-2	$+4$	$+8$	$+10$

$$\text{Avg. of class} = x + \left(\frac{-2+4+8+10}{10}\right)$$
$$= x + \frac{20}{10} = (x+2) \text{ years}$$

106. (a) Age of supervisor = 41 + 24 × 0.75 = 41 + 18 = 59 yrs.

Alternate Method:
Person → 24 : 1
$$\text{Avg.} \rightarrow \underbrace{40.25 : x}_{\text{Avg.} \rightarrow 41}$$
$\Rightarrow (40.25 - 41) \times 24 = (41 - x) \times 1$
$\Rightarrow -0.75 \times 24 = 41 - x$
$$\Rightarrow x = 41 + \frac{75}{100} \times 24$$
$\therefore x = 41 + 18 = 59$

107. (c) Age of class teacher
= 17 + (2 × 10) = 37 years

108. (d) Weight of lifted employee
$$= 62.5 + \frac{250}{1000} \times 119$$
= 62.50 + 29.75
= 92.25

109. (d) Total rings = 6 × 38 = 228
After removing the blue basket,
Total rings = 34 × 5 = 170
Rings in blue basket = 228 – 170 = 58

Alternate Method:
No. of rings is blue basket
= 38 + (38 – 34) × 5 = 38 + 20 = 58

110. (a) Weight of the student who left the class = 40 + 0.5 × 14
= 40 + 7 = 47

111. (d) Excluded Number
= 18 – (20 – 18) × 7 = 4

112. (b) Total weight of a class = 35 × 40 = 1400
Sum of weight of 5 students who left the class = 5 × 42 = 210
Sum of weight of remaining students = 1400 – 210 = 1190
Average weight of remaining student
$$= \frac{1190}{30} = 39\frac{2}{3} \text{ kg.}$$

Alternate Method:
Let, Average of 30 student = 40
$$\text{Net deviation} = 40 - \frac{2 \times 5}{30} = 40 - \frac{1}{3}$$
$$= 39\frac{2}{3}$$

Alternate Method:
$$\begin{array}{lccccc} & \underbrace{\text{Total}} & & \underbrace{\text{Out}} & & \underbrace{\text{Remain}} \\ \text{Student} \rightarrow & 35 & & 5 & & \\ & 7 & & 1 & = & 6 \\ & \downarrow \times 40 & & \downarrow \times 42 & & \\ \text{Weight} \rightarrow & 280 & - & 42 & = & 238 \end{array}$$
$$\text{Avg.} = \frac{238}{6} = \frac{119}{3} = 39\frac{2}{3} \text{kg.}$$

113. (a) Let, the highest and lowest marks be H and L respectively
ATQ,
$$\frac{19 \times 48 - (H+L)}{17} = (48 - 4)$$
$\Rightarrow 912 - (H + L) = 748$
H + L = 164
$$\therefore \frac{H+L}{2} = 82$$

Alternate Method:
$$\begin{array}{ccc} \text{No.} & & \text{Avg.} \\ 2\left(\begin{array}{l} 19 \\ 17 \end{array}\right. & & \left.\begin{array}{r} 48 \\ 44 \end{array}\right) 4 \end{array}$$
Highest + Lowest = 48 × 2 + 4 × 17
= 96 + 68 = 164
$$\because \text{Avg.} = \frac{164}{2} = 82$$

114. (d) ∴ Weight of new person
= 150 – 3 × 5 = 150 – 15 = 135

115. (a) Weight of new student
$$= 10 \times \frac{1}{2} + 51 = 56 \text{ kg}$$

Alternate Method:-
Let, A = Old average
$$\Rightarrow A \times 10 - 51 + \text{new} = \left(A + \frac{1}{2}\right) 10$$
$\Rightarrow$ New – 51 = 5
∴ New student = 56 kg.

116. (d) Weight of new boy
= 39 + (9 × 5) = 39 + 45 = 84 kg

117. (c) A new man increase 3.5 kg in avg weight of 10 man each so tot increased weight = 10 × 3.5 = 35
∴ Weight of new man = 45.5 + 35
= 80.5 kg

118. (b) Weight of new person
= (15 × 3.2) + 52
= 48 + 52 = 100 kg

119. (d) Weight of new man
= 100 + 3 × 4 = 112 kg.

120. (a) Weight of new student
$$= 48.5 + \frac{200}{1000} \times 30 = 54.5$$

121. (a) Total change in weight of Class
= 54 × 7 – 40 × 7 = 14 × 7
∴ New Average of class
$$= 39 + \frac{14 \times 7}{49} = 41$$

Alternate Method:
Net deviation = (– 40 + 39) × 7 + (54 – 39) × 7 = – 7 + 105 = 98
$$\text{New Avg. weight} = 39 + \frac{98}{49}$$
= 39 + 2 = 41

122. (d)

	Initially	Left	Join
No. of student	45	6	8
Average	52	40	43

New Average
$$= \frac{45 \times 52 + (8 \times 43 - 6 \times 40)}{45 - 6 + 8}$$
$$= \frac{2340 + 344 - 240}{47} = \frac{2444}{47} = 52$$

Alternate Method:
Avg. score of class = 52 – (52 – 40) × 6 + (52 – 43) × 8
= 52 – 72 + 72 = 52

123. (b) ATQ,
Let, Total no. of students initially = x
$$\Rightarrow \frac{x+5}{5 \times 4} = \frac{x-5}{3.2 \times 5} \Rightarrow \frac{x+5}{20} = \frac{x-5}{16}$$
$\Rightarrow 4x + 20 = 5x - 25 \Rightarrow x = 45$

124. (c) Let initially no. of students = N
ATQ,
$$\frac{-(155.6 - 150.5) \times 12 + (155.6 - 159) \times 7}{-34\text{mm}} = N + 12 - 7$$
$$\Rightarrow \frac{-5.1 \times 12 - 3.4 \times 7}{-34\text{mm}} = N + 5$$
$$\Rightarrow \frac{-61.2 - 23.8}{-34\text{cm}} = N + 5$$
$$\Rightarrow \frac{85}{34} \times 10 = N + 5 \Rightarrow 25 = N + 5$$
$\Rightarrow$ N = 20

125. (b) Let, Students = x
Total weight of students
= 72 × x = 72x
Deviation = –10 × 78 + 4 × 80 = –460
Now student remains = (x – 6)
$72x - 460 = (x - 6)(72 - 0.7)$
$\Rightarrow 72x - 460 = 71.3x - 427.8$
$\Rightarrow 0.7x = 32.2$
$\Rightarrow x = 46$

Alternate Method:

Let, Initially no. of students = N

ATQ,

$$\frac{-(78-72)\times 10+(80-72)\times 4}{(-0.7)} = N-10+4$$

$$\Rightarrow \frac{-60+32}{-0.7} = N-6 \Rightarrow 40 = N-6$$

$\Rightarrow N = 46$

126. (b) $10G + (R+S) = 48 \times 12 = 576$
$10G + (P+Q) = 46 \times 12 = 552$
$2P - 2R = 24$
$P - R = 12$
$10G + (R+S) + T = 46 \times 13$
$T = 598 - 552 = 46$
$T = R = 46$kg
$\therefore P - 46 = 12 \Rightarrow P = 58$kg

Alternate Method:

$P + Q - R - S = (48-46) \times 12$
$\Rightarrow 2P - 2R = 24 \Rightarrow P - R = 12$ kg.
Total weight of 12 girls + T = 46 kg.
So, weight of T = weight of R = 46kg.
Weight of P = 46 + 12 = 58 kg.

127. (c) A.T.Q.
When C is added,
$12 \times 65 + C = 13 \times 65$
$C = 65(13-12) = 65$ kg.
$Y = X = C = 65$ kg.
Sum of 12 students after replacement = $12 \times 65 = 780$
Sum of 10 students = 780 − 130 = 650
Initial sum of 12 students
= $12 \times 66 = 792$
$A + B = 792 - 650 = 142$ kg.
$A = B = 71$ kg.

Alternate Method:

$A + B - X - Y = (66-65) \times 12$
$\Rightarrow 2A - 2X = 12 \Rightarrow A - X = 6$ kg.
Total weight of 12 students + C = 65 kg.
So, weight of C = weight of X = 65kg.
$\therefore$ Weight of A = 65 + 6 = 71 kg.

128. (d) New Avg. $= 15 - \left(\frac{15-9}{30}\right)$

$$= 15 - \frac{1}{5} = 14.8$$

129. (d) Correct average

$$= 39 + \frac{(65-56)}{45} = 39 + \frac{1}{5} = 39.2$$

130. (d) Increased marks = 99 − 66 = 33

Increment in average $= \frac{33}{55} = 0.6$

131. (c) Total error = (18 + 19) − (14 + 15) = 8
$\therefore$ Actual Average

$$= 19 - \frac{8}{25} = 19 - 0.32$$

= 18.68

132. (a) Total of 16 numbers = 16 × 35 = 560
Sum of 18, 17, 24 and 35 = 94
When exclude there 4 numbers
Remaining = 12 numbers
Sum of 12 numbers = 560 − 94 = 466

New Average $= \frac{466}{12} = 38.83$

Alternate Method;

New avg.

$$= 35 + \frac{(4\times 35 - 18 - 17 - 24 - 35)}{16-4}$$

$$= 35 + \frac{46}{12} = 38.83$$

133. (c) No. of students $= \frac{93-63}{0.5} = 60$

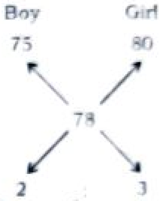
134. (c) Number of people in the group

$$= \frac{83\text{kg} - 63\text{kg}}{500\text{g}} = \frac{20000\text{g}}{500\text{g}} = 40$$

135. (a) Correct avg. = 35 − 2.5 = 32.5
Error diff. = 38.5 + 40 − 29 − 22 = 27.5
Avg. increased by 2.5 due to 27.5.
This 2.5 must be divided equaly in all the persons.
$\therefore$ Number of persons in the group

$$= \frac{27.5}{2.5} = 11$$

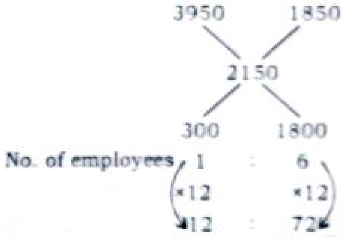
136. (a)



Boy
Girl
75
80
78
2
3

$\therefore$ Ratio of number of boy and girl = 2 : 3

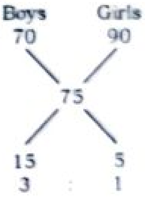
137. (c)



3950
1850
2150
300
1800
No. of employees
1
6
×12
×12
12
72

Total number of employees = 12 + 72 = 84

138. (b)

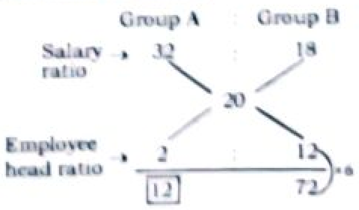


Boys
Girls
70
90
75
15
5
3
1

$\therefore$ Required % $= \frac{3}{(3+1)} \times 100 = 75\%$

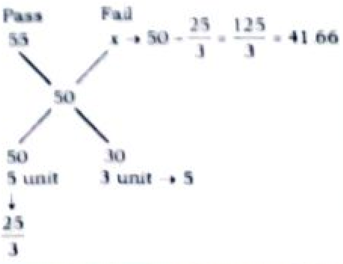
139. (b) Let, Total number of employees in A = 'x'.
ATQ,
$20{,}000(72 + x) = 32{,}000x + 18{,}000 \times 72$
$\Rightarrow 1440000 + 20000x = 32000x + 1296000$
$\Rightarrow 12000x = 1440000 - 1296000$
$\Rightarrow 12000x = 144000 \Rightarrow x = 12$

Alternate Method:



Group A
Group B
Salary ratio →
32
18
20
Employee head ratio →
2
12
12
72
×6

140. (a)



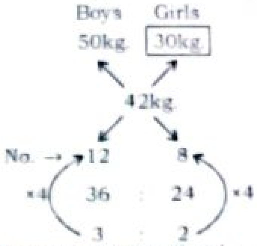
Pass
Fail
55
x → 50 − 25/3 = 125/3 = 41.66
50
50
30
5 unit
3 unit → 5
25/3

Alternate Method:

Pass : Fail
50 : 30
Data → 5 : 3
Avg → 55 : x
50

$$x = 50 - \frac{(5\times 5)}{3} = 50 - 8.34 = 41.66$$

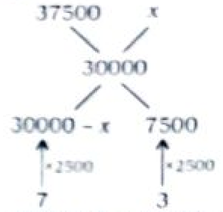
141. (a)



Boys
Girls
50kg
30kg
42kg
No. →
12
8
×4
36
24
×4
3
2

$\therefore$ Average weight of girls = 30kg.

142. (c) Let, Average of 15 members = 'x'
Then,



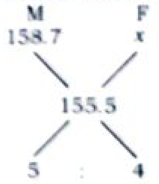
37500
x
30000
30000 − x
7500
×2500
×2500
7
3

$2500 \times 7 = 30000 - x$
$\therefore x = 30000 - 17500 = 12500$

143. (c) ATQ.
Using deviation-
Male : Female
5 : 4
Average height → 158.7 x
Overall height → 155.5 cm

$$x = 155.5 - \frac{16}{4} = 151.5 \text{ cm}$$

Alternate Method:



M
F
158.7
x
155.5
5
4

4 unit → 3.2 ⇒ 5 unit → $\frac{3.2}{4} \times 5 = 4$
$\therefore x = 155.5 - 4 = 151.5$

144. (b)

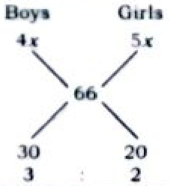
	A	B
Student	50	40
Avg.	13x	10x

$650x + 400x = 90 \times 63$

$1050x = 90 \times 63 \Rightarrow x = \frac{27}{5}$

$\therefore$ Avg. score of students in B = 10x = 54

145. (c) $20\% = \frac{-1}{5}$
Girls = 5x
Boys = 4x



Boys
Girls
4x
5x
66
30
20
3
2

$$\Rightarrow \frac{5x-66}{66-4x}=\frac{3}{2}$$

$\Rightarrow 10x - 132 = 198 - 12x$

$\Rightarrow 22x = 330 \Rightarrow x = 15$

Avg. marks of girls = 5 × 15 = 75

Alternate Method:

	Total students	Boys Girls
	5	3 : 2
	B	G
Avg. score →	4x	5x

$$\frac{3\times4x+2\times5x}{5}=66\Rightarrow22x=330$$

$\Rightarrow x = 15$

Avg. score of girls = 5x = 5 × 15 = 75

146. (b) 20 × 35 + 40 × 40 = 60 × x

$\Rightarrow 700 + 1600 = 60x$

$\Rightarrow 2300 = 60x$

$\Rightarrow x = 38.33$

Alternate Method:

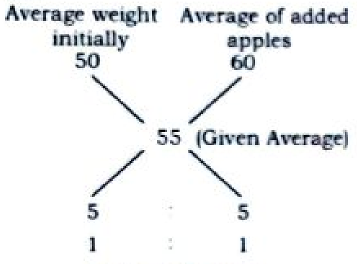
Let, Avg. = 35

	G	B
	20	40
Data →	1	2
Avg. →	35	40

$$\text{Deviation} = \frac{+5\times2}{3}=\frac{10}{3}=3.33$$

∴ Avg. weight of whole class = 35 + 3.33 = 38.33

147. (b)



1 unit → 6 apples

148 (a) 13th inning → 97 runs

Let, Old average = x.

$$\text{ATQ, } \frac{97-x}{13}=5\Rightarrow 97-x=65$$

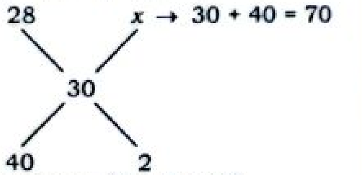
$\Rightarrow x = 32$

∴ Average after 13th innings = 32 + 5 = 37

Alternate Method:

Average score after 13th innings = 97 − 12 × 5 = 97 − 60 = 37

149. (a)



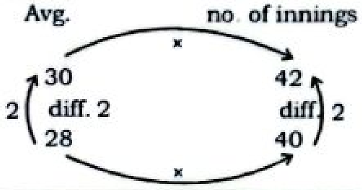
Max + Min = 70 × 2 = 140

Max − Min = 100

Max = 120

Alternate Method:

Given,



∴ Max + Min = 60 + 80 = 140 (i)

Max − Min = 100 (ii)

$$\therefore \text{Max Score} = \frac{140+100}{2}=120$$

150. (d) Let, Avg. = 72

Players	10	5	5	2
Average	80	75	55	x
	+8	+3	−17	

72

Deviation = 80 + 15 − 85 = +10

∴ Average of remaining 2 students =

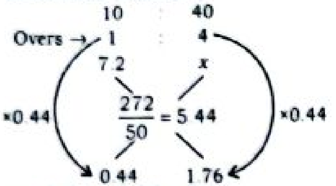
$$72-\frac{10}{2}=67$$

151 (b)

	10 overs	40 overs
Avg.	7.2	$\boxed{5}$
Total runs	72	200

Total 272

Alternate Method:



x = 5.44 − 0.44 = 5

152. (d) Avg. of first 3 matches = 122

4th match = 122 + 8 × 4 = 154 runs

5th match = 154 − 14 = 140

2nd + 3rd = 656 − 154 − 140

2nd + 3rd = 362

1st + 2nd + 3rd = 122 × 3 = 366

∴ 1st match = 366 − 362 = 4

$$153.\ (c)\ 12.5\% = \frac{1}{8}$$

Total change in age of Family members $= \left(40\times\frac{1}{8}\right)\times7=35$

∴ Age of the guest = 40 + 35 = 75

154. (d) Sum of age = 25 × 3 = 75

A : B : C Total

3 5 7 → 15

↓×5 ↓×5

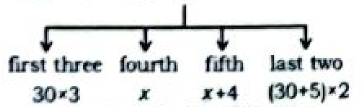
15 years 75 years

155. (a) Abhay + Wife + Child = (42 + 6) × 3 = 144

Wife + Child = (30 + 8) × 2 = 76

Present age of Abhay = (144 − 76) = 68 years

156. (b) Total sum of 7 students = 28 × 7 = 196



$\Rightarrow x + x + 4 = 196 - 90 - 70 = 36$

$$\Rightarrow \frac{2x+4}{2}=18$$

157. (d) Total present age of (A + B + C) = (22 + 8) × 3 = 90

Present age of (A + C) = 30.5 × 2 = 61

Present age of B = 90 − 61 = 29

∴ Age of B after 3 years = 29 + 3 = 32

158. (a) Average of lefted men

$$=\frac{35+48+49}{3}=\frac{132}{3}=44$$

Average of new women

$$=44+\frac{3\times10}{3}=54$$

159. (c) Ratio of 3 person = 2 : 5 : 7

Sum of 3 person = 56 × 3

14 unit = 56 × 3

1 unit = 12

Youngest person = 2 unit = 2 × 12 = 24

160. (a) K + W + C = (38 + 6)3 = 132

W + C = (32 + 8)2 = 80

∴ K = 52 years

161. (b) Avg. age of newly added member

$$=62.5-\frac{(62.5-58.2)}{30}\times150$$

$$=62.5-\frac{645}{30}=62.5-21.5=41$$

162. (a)

7	7	7th
61	65	x
−6	−2	

13 → 67

Marks of 7th student = 67 + (−42 − 14

= 67 − 56 = 11

163. (a)

Books	5	5
Avg of pages	430	380
Deviation	+30	−20

Let, Overall avg. 400

Net deviation = 150 − 100 = 50

No. of pages in 5th book = 400 + 50 = 45

164. (d)

Sub.	3	3	3rd
Avg.	75	82	66
	0	+7	−9

Let, Avg. = 75

$$\text{Deviation} = \frac{21+9}{5}=\frac{30}{5}=6$$

∴ Average of five subjects = 75 + 6 = 81

165. (c) 8th Result = 15 × 21 − (7 × 21 + 7 × 20) = 315 − 287 = 28

Alternate Method:

Data →	7	7	1
Avg. →	21	20	x

Net deviation $= (\overset{21}{-1})\times 7 = -7$

∴ x = 21 + 7 = 28

166. (d)

18 numbers	19th	20th
↓	29	31
x	−3	−1

Total avg. 32

Deviation = − 4

$$x = 32+\frac{4}{18}=32.22$$

Alternate Method:-

An average of 20 number = 32

Total sum of 20 no. = 20 × 32 = 64

After removing 20 and 31

New total = 640 − (29 + 31) = 580

$$\text{New average} = \frac{580}{18}=32.22$$

167. (c)

Day →	31	20	20
Avg. →	925	881	915

Let, Avg. = 925

Deviation = 20 × 44 + 20 × 10 = ₹ 20 × 54 = 1080

Average income from 12 Jan to

$$\text{Jan} = 925-\frac{1080}{9}=₹\ 805$$

168. (b) A.T.Q.
$20 \times 515 + 13 \times 510$
$= 31 \times 512 + 19^{th} + 20^{th}$
$\Rightarrow 10300 + 6630 = 15872 + 19^{th} + 20^{th}$
$\Rightarrow 19^{th} + 20^{th} = 16930 - 15872$
Average of $19^{th} + 20^{th} = \frac{1058}{2}$
Average = 529

Alternate Method:
Let, Avg. = 512
No. → 31 20 13
Avg. → 512 515 510
Net deviation $= +3 \times 20 - 2 \times 13$
$= 60 - 26 = 34$
Avg. of 19th and 20th December
$= 512 + \frac{34}{2} = 529$

169. (a) Temperature of 30 day = $24°C \times 31 = 744$.
First 16 days → $22°C \times 16 = 352$
Last 16 days → $26°C \times 16 = 416$
Temperature of 16th days = $(352 + 416) - 744 = 768 - 744 = 24°C$

Alternate Method:-
First Last
Days → 16 : 16
Average → $\underbrace{22°C \quad : \quad 26°C}_{24°C}$
Net deviation $= (24 - 22) \times 16 + (24 - 26) \times 16 = 32 - 32 = 0$
∴ Temprature on 16th day = 24°C

170. (b) Sum of temperature of first four days $= 25° \times 4 = 100°$
Sum of temperature of last four days $= 30° \times 4 = 120°$
Sum of temperature of the entire week $= 27° \times 7 = 189°$
∴ Temperature of fourth day $= (100° + 120°) - 189° = 220° - 189° = 31°C$

Alternate Method:
Days → 4 : 4
Avg.→ $\underbrace{25 \quad : \quad 30}_{27}$
Net deviation $= (27 - 25) \times 4 + (27 - 30) \times 4 = 8 - 12 = -4$
Temperature on 4th day = 27° + 4
= 31° C

171. (c) ATQ,
$13 \times 52.8 + 13 \times 62.2 - 13^{th}$ number
$= 25 \times 54$
$\Rightarrow 13(115) - 13^{th}$ number = 1350
$\Rightarrow 1495 - 13^{th}$ number = 1350
$\Rightarrow 13^{th}$ number = 145
∴ Average of 24 number after excluding 13th number
$= \frac{1350 - 145}{24} = \frac{1205}{24} = 50.2$

Alternate Method:

	Total	First	Last
No. →	25	13	13
Avg. →	54	52.8	62.2

Let, Avg. = 54
Net Deviation $= -1.2 \times 13 + 8.2 \times 13$
$= -15.6 + 106.6 = +91$
New Avg. when 13th number is excluded $= 54 - \frac{91}{24} = 50\frac{5}{24} = 50.2$

172. (b) Avg. = 77
No. → 28 14 15
Avg. → 77 74 84
Net deviation $= -3 \times 14 + 7 \times 15$
$= -42 + 105 = 63$
Avg. after excluding 14th no.
$= 77 - \frac{63}{27} = 77 - \frac{7}{3} = 74.67$

173. (b) Let, Avg. = 48
No. → 19 7 13
Avg. → 48 50.6 47.6
Net deviation $= 2.6 \times 7 - 0.4 \times 13$
$= 18.2 - 5.2 = 13$
Avg. after excluding 7th no.
$= 48 - \frac{13}{18} = 47.3$

174. (c) Data → 25 13 13
Avg. → $\underbrace{64 \quad 62.8}_{-1.2}$ 72.2
Net deviation $= -1.2 \times 13 + 8.2 \times 13$
$= 13 \times 7 = 91$
13th number = 64 + 91 = 155
12th No. = 61 (Given)
Avg. of remaining no.
$= \frac{64 \times 25 - (61 + 155)}{23} = \frac{1600 - 216}{23}$
= 60.2

175. (a) ATQ,
Number Average

$$\begin{tikzcd} 12 \arrow[r] & 47 \arrow[d, bend left, "-2 \times 5"] \arrow[dd, bend left=60, "+5 \times 4"] \\ 5 \arrow[r] & 45 \\ 4 \arrow[r] & 52 \end{tikzcd}$$

10th 11th 12th
x $(x + 10)$ $(x - 5)$
$\Rightarrow x + (x + 10) + (x - 5) - 10 + 20 = 47 \times 3$
$\Rightarrow x = 42$
∴ Average $= \frac{(x + 10) + (x - 5)}{2}$
$= x + 2.5 = 42 + 2.5 = 44.5$

176. (d) Let 10th number = x
11th number = $x + 10$
12th number = $x - 5$
Average of last three number
$= 48 + \frac{(48 - 45) \times 5 + (48 - 52) \times 4}{3}$
$\Rightarrow \frac{x + (x + 10) + (x - 5)}{3} = 48 - \frac{1}{3}$
$\Rightarrow \frac{3x + 5}{3} = \frac{143}{3}$
$\Rightarrow x = 46$
∴ Average of $11^{th} + 12^{th}$ number
$= \frac{x + 10 + x - 5}{2}$
$= x + 2.5 = 46 + 2.5 = 48.5$

Alternate Method:-

$$5\text{ No.} + 4\text{ No.} + \underbrace{\overset{x}{10^{th}} + \overset{(x+10)}{11^{th}} + \overset{(x-5)}{12^{th}}}_{-\frac{1}{3}} = 48\ (\text{Let})$$

$$\underbrace{\begin{matrix} 45 \\ \downarrow \\ -3 \times 5 \\ -15 \end{matrix} \qquad \begin{matrix} 52 \\ \downarrow \\ +4 \times 4 \\ +16 \end{matrix}}_{+1}$$

$\frac{10^{th} + 11^{th} + 12^{th}}{3} = 48 - \frac{1}{3}$

$\Rightarrow \frac{x + (x + 10) + (x - 5)}{3} = \frac{143}{3}$
$\Rightarrow 3x = 138$
$\Rightarrow x = 46$
∴ Required Average $= \frac{(46 + 10) + (46 - 5)}{2}$
$= \frac{56 + 41}{2} = \frac{97}{2} = 48.5$

177. (d) Day → 31 18 15 17th 18th
Avg. → 501 495 505 x $x + 50$
Let, Avg. = 501
Deviation $= -18 \times 6 + 4 \times 15 = -48$
ATQ,
$501 \times 2 - 48 = x + x + 50$
$\Rightarrow 1002 - 48 = 2x + 50$
$\Rightarrow 2x = 904 \Rightarrow x = 452$
18th March = 452 + 50 = ₹ 502

178. (d)
Number → 6 7 7th 8th 9th
Average → 45 53 $\overline{x + 3 \quad x + 7 \quad x}$
Deviation → −3 +5 sum = 48 × 3 − 17 = 127
Let. Avg. = 48
$3x + 10 = 127$
$x = 39$
Net deviation = − 18 + 35 = 17
Avg of 7th and 9th no. $= \frac{x + x + 3}{2}$
$= \frac{81}{2} = 40.5$

179. (d)

	Total	First	Last
No.	12	4	5
Avg.	39	40	35

Deviation $= 4 \times 1 + 5 \times (-4) = -16$
V : VI : VII
$(x + 5)$: $(x + 11)$: x
Thus,
$\Rightarrow x + 5 + x + 11 + x = 39 \times 3 + 16$
$\Rightarrow 3x + 16 = 39 \times 3 + 16$
$\Rightarrow 3x = 39 \times 3 \Rightarrow x = 39$
∴ Average of V and VI number
$= \frac{x + 5 + x + 11}{2} = x + 8 = 47$

180. (d) M + W + F = 41 × 3 = 123°C
W + Th + F = 42 × 3 = 126°C
Th = 43°C
W + F = 126 − 43 = 83°C
M = 123 − 83 = 40°C

Alternate Method:
Thursday − Monday = (42°C − 41°C) × 3
= 3°C
⇒ 43°C − Monday = 3°C
[Thursday = 43°C (given)]
⇒ Monday = 40°C

181. (b) ATQ,
$\frac{\frac{a}{3} + b + c}{3} = \frac{\frac{b}{3} + \frac{c}{3} + x}{3}$
$\Rightarrow \frac{a}{3} + b + c = \frac{b}{3} + \frac{c}{3} + x$
Multiply by 3 both sides
We get
$\Rightarrow a + 3b + 3c = b + c + 3x$
$\Rightarrow 3x = a + 2b + 2c$

182. (b) Given that,
$52 + 71 + 43 + 22 + a + b$
$= 55 \times 6 = 330$
$\Rightarrow a + b = 142$

Also,

$42 + 45 + 49 + 51 + 42 + c + d$

$= 53 \times 7 = 371 \Rightarrow c + d = 142$

$\therefore \frac{a+b+c+d}{4} = \frac{142+142}{4} = 71$

Alternate Method:

$$\underbrace{\begin{array}{cccccc}52 & 71 & 43 & 22 & a & b\\ +3 & -16 & +12 & +33 & & \end{array}}_{55}$$

$a + b = 55 + 55 + 32 = 142$

$$\underbrace{\begin{array}{ccccccc}42 & 45 & 49 & 51 & 42 & c & d\\ +11 & +8 & +4 & +2 & +11 & & \end{array}}_{53}$$

$c + d = 53 + 53 + 36 = 142$

$\therefore \frac{a+b+c+d}{4} = \frac{142+142}{4} = 71$

183. (a)

$$\begin{array}{ccc}A & B & C\\ 9K & 3k & 4k\end{array}$$

ATQ,

$\frac{9k + 3k + 4k}{3} = 112$

$k = 21$

$\therefore$ Smallest no. $= 3k = 3 \times 21 = 63$

184. (d)

$$\begin{array}{ccccc}A & : & B & : & C\\ x & : & 2x & : & 6x\end{array}$$

ATQ,

$\frac{x + 2x + 6x}{3} = 30 \Rightarrow 9x = 90 \Rightarrow x = 10$

$\therefore$ Difference between A and C

$= 6x - x = 5x = 50$

185. (a) Let, Sum of last four no. $= 4x$

Then first no. $= 3x$

Sum of five no. $= 56 \times 5 = 280$

ATQ,

$7x = 280 \Rightarrow x = 40$

$\therefore$ Avg. of last four no. $= 40$

186. (b) $\frac{x + \frac{1}{x}}{2} = 2 \Rightarrow x + \frac{1}{x} = 4$

ATQ,

$x^3 + \frac{1}{x^3} = 4^3 - 3 \times 4 = 52$

$\frac{x^3 + \frac{1}{x^3}}{2} = \frac{52}{2} = 26$

187. (c) $1244 + 2345 + 33x3 + 4x38$

$= 2925 \times 4$

$\Rightarrow 35\underline{89} + 33\underline{x3} + 4\underline{x38} = 11700$

$89 + x3 + 38 = 00$

$x = 7$ Satisfy

$\therefore \frac{(5x+3)+(9x-5)}{2} = \frac{38+58}{2} = 48$

188. (b) Given, $\frac{A+B+C}{3} = \frac{1}{13}$

$\Rightarrow A + B + C = \frac{3}{13} \Rightarrow \frac{1}{7} + \frac{1}{8} + C = \frac{3}{13}$

$\therefore C = \frac{3}{13} - \frac{15}{56} = \frac{168-195}{728} = \frac{-27}{728}$

189. (b) $a + b + c + d = 4\ (2d + 4)$

$\Rightarrow a + b + c + d = 8d + 16$

[$a + b = 16$, $b + c = 10$, $c + d = 8$ (given)]

$\Rightarrow 16 + 8 = 8d + 16 \Rightarrow 8d = 8 \Rightarrow d = 1$

$\therefore c = 7, b = 3, a = 13$

$e = a + d + 1 = 13 + 1 + 1 = 15$

$\because$ Avg. of d and e $= \frac{1+15}{2} = 8$

190. (a) Average $= \frac{2 \times 265 + 13 \times 130}{15}$

$= \frac{2220}{15} = 148$

Alternate Method:

Let, Average = 130

$$\begin{array}{lccc}\text{Days} \rightarrow & 4 & : & 26\\ \text{Average} \rightarrow & 265 & : & 130\end{array}$$

Net deviation $= \frac{135 \times 4}{30} = 18$

Net average $= 130 + 18 = 148$

191. (d) Month of 30 days starting with Sunday has 5 Sundays.

$$\begin{array}{lcccc} & & \text{Sun.} & & \text{Mon.-Sat}\\ \text{Day} & \rightarrow & 5 & : & 25\\ \text{Average} & \rightarrow & 410 & : & 230\end{array}$$

Let, Average = 230

Net deviation $= (410 - 230) \times 5$

$= 900$

$\therefore$ Average attendance of whole month

$= 230 + \frac{900}{30} = 230 + 30 = 260$

Alternate Method:-

Month of 30 days starting with Sunday has 5 Sundays.

$$\begin{array}{lccc}\text{Day } 5 & & : & 25\\ 1 & & : & 5\\ \big\downarrow \times 410 & & & \big\downarrow \times 230\end{array}$$

Avg $= \frac{410 \times 1 + 230 \times 5}{6} = 260$

192. (b) $\frac{A+B}{2} + C = 168$

$\frac{B+C}{2} + A = 174$

$\frac{C+A}{2} + B = 180$

On adding all

$2(A + B + C) = 522$

$\Rightarrow A + B + C = 261$

$\therefore$ Average of $(A + B + C) = \frac{261}{3} = 87$

Alternate Method:

Average $= \frac{168 + 174 + 180}{6} = \frac{522}{6} = 87$

193. (a) $A + B + C = 70 \times 3 = 210$ kg

$A + B + C + D = 60 \times 4 = 240$ kg

$D = 240 - 210 = 30$ kg

$E = 30 + 5 = 35$ kg

$B + C + D + E = 59 \times 4$

$= 236$ kg

$B + C = 236 - 30 - 35$

$= 171$ kg

$A + B + C = 210$ kg

$A = 210 - 171 = 39$ kg

Alternate Method:

$D = (70 - 60) \times 3 = 30$ kg.

$E = 30 + 5 = 35$ kg.

$A - E = (60 - 59) \times 4$

$\Rightarrow A - E = 4$ kg. $\Rightarrow A - 35 = 4$ kg.

$\Rightarrow A = 39$ kg.

194. (a) $A + B + C = 77 \times 3 = 231$ kg. ...(i)

$A + B = 68 \times 2 = 136$ ...(ii)

$B + C = 83 \times 2 = 166$ ...(iii)

$A + 2B + C = 136 + 166 = 302$

$\underline{A \pm B \pm C = 231}$

$B = 302 - 231 = 71$ kg

195. (b) $\frac{X+Y}{2} = \frac{Y+Z}{2} - 35$

$\Rightarrow X + Y = Y + Z - 70$

$\Rightarrow Z - X = 70$

$\Rightarrow X = Z - 70$

$\Rightarrow X = 85 - 70 = 15$

196. (b)

$$\begin{array}{lccc} & A & : & B\\ & 50 & : & 62\\ \text{Data} \rightarrow & 25 & : & 31\\ \text{Avg.} \rightarrow & 6x & & 5x\end{array}$$

$\frac{25 \times 6x + 31 \times 5x}{56} = 75$

$\Rightarrow 305x = 75 \times 56$

$\Rightarrow x = 13.77$

$\therefore$ Avg. score of students in section A $= 6x = 6 \times 13.77 = 82.6$

197. (a)

$$\begin{array}{lccccc}R \rightarrow & 64 & < & W & < & 74\\ S \rightarrow & 60 & < & W & < & 69\\ M \rightarrow & & & W & \le & 68\\ F \rightarrow & & & W & \le & 67\\ \hline & 64 & < & W & \le & 67\end{array}$$

Weight = 65, 66 & 67

Therefore, the average of different probable weight of raghav measured is 66 kg.

198. (c)

$$\begin{array}{lccccc} & \text{Male} & : & \text{Female} & : & \text{Children}\\ & 20 & : & 24 - x & : & x\\ \text{Avg.} \rightarrow & \underbrace{54 & : & 49 & : & 30}_{48.25}\end{array}$$

$(20 \times 5.75) + (24 - x) \times 0.75 - x \times 18.25 = 0$

$\Rightarrow 115 + 18 - 0.75x - 18.25x = 0$

$\Rightarrow 133 - 19x = 0$

$\Rightarrow 19x = 133$

$\Rightarrow x = 7$

Diff. b/w female and children $= 24 - x - x = 24 - 7 - 7 = 10$

199. (a) Increase in marks

$= 27 + 10 + 18 = 55$

Change in average

$= 72.6 - 67.6 = 5$

No. of papers $= \frac{55}{5} = 11$

200. (c) When we subtracted 2 from each 'n' numbers then the total deduction $= 2n$

When we subtracted 5 from each 'n' numbers then the total deduction $= 5n$

Now Equal the sum in Both condition

$102 + 2n = 12 + 5n$

$\Rightarrow 3n = 90$

$\Rightarrow n = 30$

Total number = 30

Average $= \frac{102 + 2n}{n}$

$= \frac{102}{n} + 2 = \frac{102}{30} + 2 = 5.4$

Alternate Method:

Total number $= \frac{102 - 12}{5 - 2} = 30$

Average of these no.

$= \frac{102 + 2 \times 30}{30} = 5.4$

201. (d) Total numbers

$= 2 + 5k + 5k - 7 + 2k - 3 + k + 2 = 13k - 6$

$$\text{Avg.} = \frac{2(2+5k)+3(5k-7)+4(2k-3)+5(k+2)}{13k-6} = 2.85$$

$$\Rightarrow \frac{4+10k+15k-21+8k-12+5k+10}{13k-6} = 2.85$$

$$\Rightarrow \frac{38k-19}{13k-6} = 2.85$$

$\Rightarrow 38k - 19 = 37.05k - 17.1$

$\Rightarrow k = 2$

Now, New average

$$= 2.85 + \frac{4(2+5k)}{13k-6} = 2.85 + \frac{12}{5}$$

$= 5.25$

202. (b) $\frac{5x+7y}{12} = 37$ ....(i)

$\frac{7x+5y}{12} = 35$ ....(ii)

From (i) & (ii)

$25x + 35y = 37 \times 12 \times 5$

$49x + 35y = 35 \times 12 \times 7$

$\underline{-\quad\ -\quad\ -}$

$-24x = 12(185 - 245)$

$24x = 720$

$x = 30$

$\therefore \frac{x}{6} = \frac{30}{6} = 5$

203. (d) Change in average = 76 − 71 = 5

Increase = 35 + 11 + 4 = 50

$\therefore$ No. of papers $= \frac{50}{5} = 10$

204. (a)

A : B : C

30 : 25 : 20

Avg. → $x + 5.5$ $x + 2.5$ x

ATQ,

$\frac{1725}{30} = x + 5.5$

$\Rightarrow 57.5 = x + 5.5$

$\Rightarrow x = 52$

$\therefore$ Avg. of A and C

$$= \frac{(57.5 \times 30) + 20 \times 52}{30 + 20}$$

$$= \frac{1725 + 1040}{50}$$

$= 55.3$

Alternate Method:

	A	:	B	:	C
No. →	30	:	25	:	20
Avg. wt →	$x + 3$	:	x	:	$x - 2.5$
	↓		↓		↓
	$\frac{1725}{30} = 57.5$		54.5		52

$x + 3 = 57.5$

$\Rightarrow x = 54.5$

A : C

3 : 2

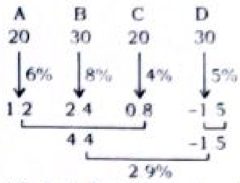
57.5 52

$$\text{Avg.} = 52 + \frac{(57.5 - 52) \times 3}{3 + 2}$$

$= 52 + 1.1 \times 3 = 52 + 3.3$

$= 55.3$

205. (a) Solve by deviation method



206. (d) Let, Total stock = 100 unit

$\because$ A ⇒ 30 % of 100 = 30

$\therefore$ Return $= 30 \times \frac{1}{20} = 1.5$

$\because$ B ⇒ 40% of 100 = 40

$\therefore$ Return $= 40 \times \frac{1}{10} = 4$

$\because$ C ⇒ 30% of 100 = 30

$\therefore$ Return $= 30 \times \frac{8}{100} = 2.4$

$\therefore$ Sum = 1.5 + 4 + 2.4 = 7.9

$\therefore$ Average return $= \frac{7.9}{100} \times 100 = 7.9\%$

Alternate Method:

	A	:	B	:	C
	30%	:	40%	:	30%
Portfolio →	3	:	4	:	3
Stock →	5%	:	10%	:	8%

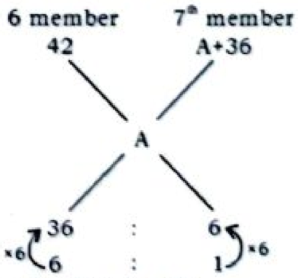
$$\text{Total \%} = \frac{3 \times 5 + 4 \times 10 + 3 \times 8}{3 + 4 + 3} = 7.9\%$$

207. (a) Maximum possible number of positive integers = 24

Note:- If average is zero then it means that sum of all 25 integers is also zero.

208. (c) Max. 26 may be greater than zero and 27th term will be opposite sign of sum of 26 terms.

209. (b) Let, Avg. of seven members = A



$\therefore$ A = 42 + 6 = 48

$\therefore$ Age of seventh member = 48 + 36 = 84 yrs.

210. (c) Let, Weight of Rohan = R

Average weight of 3 friends = F

ATQ,

R = F + 8 __ (i)

R + 3F = 62 × 4 = 248 ___ (ii)

Put the value of eqn (i) in eqn (ii):

⇒ F + 8 + 3F = 248

⇒ 4F = 240 ⇒ F = 60

$\therefore$ R = 60 + 8 = 68 kg

$\therefore$ Weight of Rohan = 68 kg.

211. (d) Let, Avg. weight of all the 14th person = x.

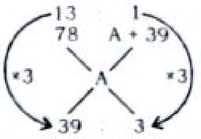
$$\text{ATQ, } \frac{13 \times 78 + (x + 39)}{14} = x$$

$\Rightarrow 13 \times 78 + 39 = 13x$

$\Rightarrow x = 81$

$\therefore$ Weight of 14th person = 81 + 39 = 120 kg

Alternate Method:



A = 78 + 3 = 81 kg

Weight of 14th person

= A + 39 = 81 + 39 = 120 kg

212. (c) Let, Avg. = x

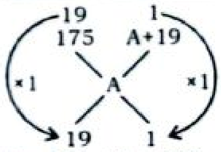
ATQ,

$20x = 19 \times 175 + (x + 19)$

$\Rightarrow 19x = 19 \times 176 \Rightarrow x = 176$

$\therefore$ Total money = 176 × 20 = ₹ 3520

Alternate Method:



A = 175 + 1 = 176

Total Amount spent by then

= 176 × 20 = 3520

213. (a) Let, Average = x

ATQ,

$12x = 18 \times 11 + (x - 11)$

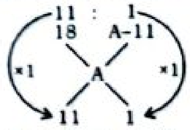
$\Rightarrow 12x = 198 + x - 11$

$\Rightarrow 11x = 187 \Rightarrow x = 17$

$\because$ Total money = 12 × 17

= ₹ 204

Alternate Method:

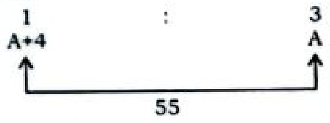


A = 18 − 1 = 17

$\therefore$ Total money spent = 17 × 12

= 204

214. (b)



$$\frac{3A + A + 4}{4} = 55$$

⇒ 4A + 4 = 220

⇒ 4A = 216 ⇒ A = 54

$\therefore$ P's weight = 54 + 4 = 58 kg.

215. (c)

Students	/Student exp.	Daily exp.
90	x	$90x$
120	$(x - 10)$	$120x - 1200$

560

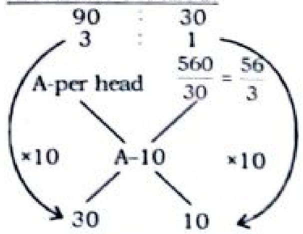
ATQ,

$\Rightarrow 120x - 1200 - 90x = 560$

$\Rightarrow 30x = 1760$

$\therefore 90x = 1760 \times 3 = 5280$

Alternate Method:



$A - 10 = \frac{56}{3} + 30 \Rightarrow A - 10 = \frac{146}{3}$

$\Rightarrow A = \frac{176}{3}$

$\therefore$ Total expenditure $= 90 \times \frac{176}{3}$

$= 30 \times 176 = 5280$

216. (c) Monthly income of:

$A + B = 5050 \times 2 = 10100$

$B + C = 6250 \times 2 = 12500$

$A + C = 5200 \times 2 = 10400$

$2(A + B + C) \quad = 33000$

$\therefore A + B + C = \frac{33000}{2} = 16500$

217. (b) Let, Average expenditure = ₹x

ATQ,

$\frac{75 \times x + 240}{(75 + 15)} = (x - 5)$

$\Rightarrow 75x + 240 = 90x - 450$

$\Rightarrow 15x = 690 \Rightarrow x = 46$

$\therefore$ Original expenditure

$= 75 \times 46 =$ ₹ 3450

Alternate Method:

Students	Exp./Head	Daily expenses
75	x	$75x$
90	$(x-5)$	$90x - 450$

$\Big\rangle -240$

$\Rightarrow 90x - 450 - 75x = 240$

$\Rightarrow 15x = 690$

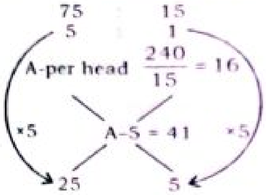
$\Rightarrow x = 46$

$\therefore$ Original exp.

$= 75 \times 46$

$= 3450$

SMART APPROACH:-



$A - 5 = 41 \Rightarrow A = 46$

Original expenditure $= 75 \times 46$
$= 3450$

218. (a) Quantity → 8 : 9

Price → 51 : 68

Let Average → 60

Devition $= 8 \times (-9) + 9 \times 8 = 0$

Now, average = 60

Alternate Method:

$\text{Average} = 51 + \frac{9 \times (68 - 51)}{17}$

$= 51 + \frac{9 \times 17}{17} = 60$

SELECTION मंत्र #03

"It takes too much time to understand the questions, and then solving it also takes longer!"

#Hacks:-

- ☞ **Break down** the question – Identify what is given, what is asked, and what options are provided.
- ☞ Practise at least **30 questions** daily in one go to build speed and accuracy.
- ☞ Use a **stopwatch** while solving questions to improve your speed.
- ☞ **SSC** repeats patterns, so revise Previous Year Questions **(PYQs)** as much as possible.

Tip: The more **PYQs** you solve, the faster you'll recognize question patterns in the exam!

SPEED BOOSTER HACKS

◆ Square of a numbers, nearer to 10^n ◆

$(98)^2 = (98 + 2)(98 - 2) + 2^2 = 100 \times 96 + 4 = 9604$

$(103)^2 = (103 - 3)(103 + 3) + 3^2$
$= 100 \times 106 + 9 = 10609$

$(993)^2 = (993 + 7)(993 - 7) + 7^2$
$= 1000 \times 986 + 49 = 986049$

$(1008)^2 = (1008 + 8)(1008 - 8) + 8^2$
$= 1016 \times 1000 + 64 = 1016064$

◆ Do it Yourself ◆

(i) $(97)^2 =$ ……………………
(ii) $(94)^2 =$ ……………………
(iii) $(107)^2 =$ ……………………
(iv) $(109)^2 =$ ……………………
(v) $(997)^2 =$ ……………………
(vi) $(1002)^2 =$ ……………………

12
Chapter
TIME & WORK

• TYPE – I •
BASED ON TWO VARIABLES

1. John alone can do a piece of work in 20 days, while Ravi alone can do the same work in 28 days. If they work together, then in how many days can both of them complete the work?

SSC CPO 03/10/2023 (Shift-02)

(a) $12\frac{2}{3}$ days (b) $12\frac{1}{3}$ days
(c) $11\frac{1}{3}$ days (d) $11\frac{2}{3}$ days

2. A completes a piece of work in 4 days and B completes it in 6 days. How long will it take to complete the same piece of work if they both work together?

SSC Phase XII 26/06/2024 (Shift-02)

(a) $2\frac{3}{5}$ days (b) 3 days
(c) $2\frac{2}{5}$ days (d) 4 days

3. Shobhita can complete a painting work in 20 hours while Saroj can complete the same work in 15 hours. In how much time (in hours) can the entire work of painting be completed, if both Shobhita and Saroj work simultaneously?

SSC CHSL 05/07/2024 (Shift-02)

(a) 8 (b) $7\frac{4}{7}$
(c) $8\frac{4}{7}$ (d) 7

4. Akhil can complete a piece of work in 24 days. Shyam can complete the same piece of work in 12 days. If both of them work together, in how many days can they complete the same piece of work?

SSC CHSL 04/07/2024 (Shift-04)

(a) 6 days (b) 8 days
(c) 10 days (d) 12 days

5. A can finish a piece of work by working alone in 4 days. B, while working alone, can finish the same work in 12days. If both of them work together, then in how many days will the work be completed?

SSC CHSL 09/07/2024 (Shift-04)

(a) 8 (b) 3
(c) 4 (d) 6

6. A and B can do a piece of work in 9 days and 15 days, respectively. If they work together, then the work will be completed in:

SSC CHSL 01/07/2024 (Shift-03)

(a) $3\frac{3}{8}$ days (b) $2\frac{1}{8}$ days
(c) $5\frac{5}{8}$ days (d) $4\frac{5}{8}$ days

7. P completes a work in 12 days and Q in 24 days. In how many days P and Q working together can complete the same work?

SSC CHSL 10/07/2024 (Shift-04)

(a) 16 days (b) 8 days
(c) 6 days (d) 12 days

8. A and B can do a work in 10 days and 40 days, respectively. How long will it take together to complete the work?

SSC CHSL 01/07/2024 (Shift-01)

(a) 12 days (b) 8 days
(c) 20 days (d) 15 days

9. P can complete $\frac{1}{5}$ of a work in 12 days and Q can complete $\frac{1}{6}$ of a work in 8 days. In how many days can both P and Q together complete the work?

SSC MTS 13/09/2023 (Shift- 03)

(a) $26\frac{2}{3}$ (b) $25\frac{4}{5}$
(c) $22\frac{4}{5}$ (d) $24\frac{2}{3}$

10. A can complete $\frac{1}{3}$ of a work in 7 days and B can complete $\frac{2}{7}$ of the same work in 10 days. In how many days can both A and B together complete the work?

SSC CGL 25/07/2023 (Shift-02)

(a) $12\frac{3}{8}$ (b) $11\frac{7}{8}$
(c) $13\frac{1}{8}$ (d) $15\frac{1}{7}$

11. A can do 1/4 part of a work in 9 days. B can do 2/3 part of the same work in 28 days. Working together, in how many days can A and B complete the whole work?

SSC CGL TIER-II (08/08/2022)

(a) $\frac{261}{15}$ days (b) $\frac{198}{17}$ days
(c) $\frac{252}{13}$ days (d) $\frac{262}{11}$ days

12. Disha takes 12 hours to copy a 75 - page manuscript, while Mohit can copy the same manuscript in 10 hours. How many honrs will it take to copy a 150 - page manuscript if they work together?

SSC CHSL 03/08/2023 Shift-04

(a) $9\frac{9}{11}$ hours (b) $10\frac{10}{11}$ hours
(c) $8\frac{9}{11}$ hours (d) $11\frac{8}{11}$ hours

13. Jason can do a piece of work alone in 23.4 days, while Refigure can do the same piece of work alone in 39 days. In how many days can the duo complete the same if they work together?

SSC CHSL 14/08/2023 (Shift-01)

(a) 14.750 (b) 14.625
(c) 14.875 (d) 14.375

14. A can do 20% of a job in 7 days and B can do 25% of the job in 7 days if they worked alone. How much of the job (in percentage) can they complete in 7 days if they worked together?

SSC CGL 17/07/2023 (Shift-04)

(a) 38% (b) 52%
(c) 56% (d) 45%

15. A can complete 3/8 part of a work in 36 days. B can complete 1/2 part of the same work in 27 days. Which of the following statement(s) is/are correct?

I. A is less efficient than B.
II. A and B working together can complete $\frac{11}{15}$ part of the same work in 36 days.

SSC CHSL 21/03/2023 (Shift-01)

(a) Neither I nor II (b) Only I
(c) Only II (d) Both I & II

16. A and B can do a piece of work in 25 days. B alone can do $66\frac{2}{3}\%$ of the same work in 30 days. In how many days can A alone do $\frac{4}{15}$ part of the same work?

SSC CPO 24/11/2020 (Shift-01)

(a) 15 (b) 20
(c) 18 (d) 12

17. Julie and Rahul together can complete the work of painting a room in 12 days. If Julie alone can paint the room in 20 days, then in how many days can Rahul complete the same work of painting the room alone?

SSC MTS 04/09/2023 (Shift-01)

(a) 30
(b) 25
(c) 40
(d) 35

18. A can complete a piece of work alone in 120 days, while A and B, working together, can complete this piece of work in 72 days. In how many days can B, working alone, complete this piece of work?

SSC CGL 26/07/2023 (Shift-02)

(a) 180
(b) 200
(c) 160
(d) 216

19. Varun and Raju, working together, can complete a job in 40 hours whereas Varun alone can complete the same job in 50 hours. The number of hours required by Raju to complete the job alone is:

SSC CGL 26/09/2024 (Shift-02)

(a) 200
(b) 150
(c) 170
(d) 190

20. A and B, working together, take 15 days to complete a piece of work. If A alone can complete the job in 18 days, how long will B take to complete the same job?

SSC CHSL 02/07/2024 (Shift-03)

(a) 90 days
(b) 33 days
(c) 15 days
(d) 8 days

21. Rohan takes 10 hours to mow a large lawn. Rohan and Mohan together can mow it in 4 hours. How long will Mohan take to mow the lawn if he works alone?

SSC CHSL 08/07/2024 (Shift-02)

(a) $\frac{16}{3}$ hours
(b) $\frac{40}{3}$ hours
(c) $\frac{10}{3}$ hours
(d) $\frac{20}{3}$ hours

22. Sapna finishes a job in 12 hours working alone. If Sapna and Riya finish the same job in 8 hours working together at their respective constant rates, then, in how many hours can Riya do the job working alone?

SSC CHSL 05/07/2024 (Shift-01)

(a) 24
(b) 18
(c) 16
(d) 20

23. Antony and Julie can simultaneously complete a work of floor decoration in 15 days and Julie alone in 20 days. In how many days can Antony alone complete the work of floor decoration?

SSC CHSL 08/07/2024 (Shift-01)

(a) 55
(b) 60
(c) 45
(d) 50

24. A and B can do a piece of work in 8 days and B alone can do it in 16 days. In how many days can A do it alone?

SSC CHSL 01/07/2024 (Shift-02)

(a) 24 days
(b) 16 days
(c) 18 days
(d) 10 days

25. Sumit and Rajiv, working together, can do a job in 20 hours whereas Sumit alone can do the same job in 25 hours. In how many hours can Rajiv alone do the job?

SSC CPO 29/06/2024 (Shift-03)

(a) 70
(b) 90
(c) 80
(d) 100

26. Jeevan can do a piece of work alone in 42 days, while Rishi and Jeevan together can do the same piece of work in 27 days. How many days will Rishi take to complete the same piece of work alone?

SSC CPO 03/10/2023 (Shift-03)

(a) $75\frac{4}{5}$ days
(b) $75\frac{1}{5}$ days
(c) $75\frac{3}{5}$ days
(d) $74\frac{3}{5}$ days

27. A can do a piece of work in 10 days while A and B together can complete it in $2\frac{1}{2}$ days. How long will B alone take to complete the work?

SSC CPO 09/11/2022 (Shift-02)

(a) $\frac{3}{10}$ days
(b) $\frac{10}{3}$ days
(c) 3 days
(d) 4 days

28. George can do 35% of the total work in 6 days. Jim and George together completed a piece of work in 12 days. In how many days could Jim, working alone. complete the entire task?

SSC CHSL 10/08/2023 (Shift-3)

(a) 36
(b) 40
(c) 42
(d) 45

29. A and B can do a work in 12 days and 16 days, respectively. If they work together for 6 days, then the fraction of the work left is.

SSC CGL 19/09/2024 (Shift-02)

(a) $\frac{5}{7}$
(b) $\frac{7}{8}$
(c) $\frac{1}{8}$
(d) $\frac{1}{7}$

30. A alone can do (1/10) part of a work in 8 hours. B alone can do (1/5) part of same work in 4 hours. If they work together, then how many hours will they take to complete (9/16) part of the same work?

SSC MTS 17/05/2023 (Shift 03)

(a) 9 hours
(b) 5 hours
(c) 8 hours
(d) 4 hours

31. Riya and Sangeeta can finish a work in 6 days and 8 days, respectively. Riya started the work alone and then after 3 days, Sangeeta joined Riya. They both finish the remaining work. How long did the total work last?

SSC CHSL 03/07/2024 (Shift-04)

(a) $4\frac{4}{7}$ days
(b) $4\frac{2}{7}$ days
(c) $4\frac{5}{7}$ days
(d) $4\frac{3}{7}$ days

32. A and B can finish a work in 6 days and 4 days , respectively. A alone worked on it for 2 days. Thereafter, B joined him. How much total time was taken by them to finish the work?

SSC CHSL 07/08/2023 Shift-02

(a) $3\frac{3}{5}$
(b) $1\frac{3}{5}$
(c) $3\frac{1}{5}$
(d) $4\frac{1}{5}$

33. A can finish a work in 25 days, a
B can do the same work in 15 da
B worked for 10 days and left t
job. A alone can finish the rema
ing work in how many days?

SSC CHSL 14/08/2023 (Shift-

(a) $7\frac{1}{3}$ days
(b) $6\frac{1}{3}$ days
(c) $8\frac{1}{3}$ days
(d) $5\frac{1}{3}$ days

34. Raju and Akber take 4 hours a
6 hours to type 32 pages and
pages, respectively, on a compu
They are given an assignment
typing 256 pages. If they wo
together, typing on two differe
computers, starting at the same tim
how much time will they take
complete the assignment (in hours

SSC CHSL 17/08/2023 (Shift-

(a) 16
(b) 14
(c) 18
(d) 12

35. Suresh alone can do a work in 1
days working 1 hour a day. Sha
alone can do the same work in
days working 5 hours a day. How
many hours do they need to wor
together in a day to complete th
same work in 10 days?

SSC MTS 08/05/2023 (Shift-0

(a) 1.5 hours
(b) 0.5 hours
(c) 1 hour
(d) 2 hours

36. Ram alone can do a work in 5 days working 4 hours a day. Seema alone can do the same work in 3 days working 10 hours a day. How many hours do they need to work together in a day to complete the same work in 6 days?

SSC CHSL 17/03/2023 (Shift-04

(a) 1 hour
(b) 3 hours
(c) 5 hours
(d) 2 hours

37. Rajesh, in his printing press, got an order to print some books, out of which he completed $\frac{17}{27}$ of the order in 34 days. In how many days did he complete the entire order of printing?

SSC CGL 09/09/2024 (Shift-01)

(a) 60
(b) 20
(c) 54
(d) 56

38. If Arun can complete $\frac{2}{3}$rd of a work in 12 days, then in how many days can he complete $\frac{1}{6}$th of the same work?

SSC CPO 05/10/2023 (Shift-0

(a) 4 days
(b) 5 days
(c) 2 days
(d) 3 days

39. Anjali is designing a wall for a social purpose. In 14 days, he completed $\frac{7}{11}$ of the work. In how many days will she complete the rest of the work?

SSC Phase X 04/08/2022 (Shift-0

(a) 10
(b) 8
(c) 12
(d) 9

• TYPE – II •

BASED ON THREE VARIABLES

40. X can d a piece of work in 14 days, Y can complete the same work in 28 days and Z can do it in 42 days. In how many days can X, Y and Z together complete the work?

SSC CHSL 09/08/2023 Shift-01

(a) $7\frac{9}{11}$ days (b) $7\frac{7}{11}$ days

(c) $7\frac{5}{11}$ days (d) $7\frac{3}{11}$ days

41. A, B and C can complete a work in 12, 15 and 20 days, respectively. How many days are required to finish the work if they work together?

SSC CHSL 02/07/2024 (Shift-04)

(a) 5 days (b) 4 days

(c) 6 days (d) 3 days

42. X, Y and Z can do a work in 24 days, 5 days and 12 days, respectively. In how many days can they do the same work if they work together?

SSC CHSL 11/07/2024 (Shift-04)

(a) $\frac{1}{24}$days (b) $3\frac{1}{13}$days

(c) 4 days (d) $\frac{7}{24}$days

43. Vipin can do a piece of work in 2 days; Vaibhav can do the same work in 3 days and Chirag can do the same work in 6 days. If they start working together, how many days will they take to complete the work?

SSC CPO 05/10/2023 (Shift-02)

(a) 3 days (b) 5 days

(c) 1 days (d) 4 days

44. A tyre has 3 punctures. The first puncture alone would have made the tyre flat in 9 minutes, the second alone would have done it in 18 minutes, the third alone would have done it in 6 minutes. If the air leaks out at a constant rate, then how long (in minutes) does it take for all the punctures together to make it flat?

SSC CGL 13/04/2022 (Shift -02)

(a) 6 (b) 3

(c) 2 (d) 1

45. X can do a work in 3 days, Y does three times the same work in 8 days, and Z does five times the same work in 12 days. If they have to work together for 6 hours in a day, then in how much time can they complete the work?

SSC CPO 23/11/2020 (Shift-02)

(a) 4 hours

(b) 5 hours

(c) 5 hours 20 minutes

(d) 4 hours 10 minutes

46. Ali, Avtar singh and Ashok working together can finish a work in 8 days. Ali alone can do in 20 days and Avtar Singh alone can do it in 24 days. In how many days can Ashok alone do the same work?

SSC CHSL 03/08/2023 (Shift-01)

(a) 30 (b) 28

(c) 26 (d) 25

47. Ram can complete a piece of work in 18 days, Reena can complete the same work in 12 days, and with the help of Shyam, they finish the same work in six days. In how many days can Shyam alone complete the same work?

SSC CHSL 14/08/2023 (Shift-03)

(a) 42 days (b) 36 days

(c) 30 days (d) 24 days

48. A can complete a piece of work in 20 days and B can complete the same work in 10 days. With the help of C, working together they completed the work in 5 days. The number of days in which C alone can complete the work is:

SSC CHSL 04/07/2024 (Shift-02)

(a) 15 (b) 10

(c) 25 (d) 20

49. Rakshit, Ajay, and Satish are sanitation workers in a Municipal Corporation. Rakshit alone takes 20 hours to clean a drain while Ajay takes 12 hours when working alone to do the same. All three together take only 5 hours to clean the drain. In how many hours, can Satish complete the work alone?

SSC CGL 17/07/2023 (Shift-01)

(a) 12 (b) 10

(c) 15 (d) 18

50. A and B can complete a piece of work in 27 days and 54 days, respectively. They completed the work in 9 days with the help of C. How many days will C take to complete $\frac{8}{9}$ of work alone?

SSC CHSL 12/08/2021 (Shift-02)

(a) 24 (b) 45

(c) 30 (d) 16

51. A and B can do a job in 10 days and 5 days, respectively. They worked together for two days, after which B was replaced by C and the work was finished in the next three days. How long will C alone take to finish 60% of the job?

SSC CPO 23/11/2020 (Shift-01)

(a) 30 days (b) 25 days

(c) 18 days (d) 24 days

52. A and B can do a job in 10 days and 5 days, respectively. They worked together for two days, after which B was replaced by C and the work was finished in the next three days. How long will C alone take to finish 40% of the job?

SSC CPO 25/11/2020 (Shift-01)

(a) 15 days (b) 18 days

(c) 10 days (d) 12 days

53. A can do 20% of the work in 4 days, B can do $33\frac{1}{3}$% of the same work in 10 days. They worked together for 9 days. C completed the remaining work in 6 days. In how many days will B and C together complete 75% of the work? do ?

SSC CHSL TIER-II 15/11/2020

(a) 12 (b) 15

(c) 10 (d) 9

54. A can do $\frac{1}{3}$ of work in 30 days, B, $\frac{2}{5}$ can do part of the same work in 24 days. They worked together for 20 days. C completed the remaining work in 8 days. In how many days will A, B and C together complete the work?

SSC CGL TIER-II 16/11/2020

(a) 10 (b) 12

(c) 18 (d) 15

55. A can do 40% of a work in 12 days while B 60% of the same work can be done in 15 days. Both work together for 10 days. C completes the remaining work in 4 days. In how many days will A, B and C together complete 28% of the same work?

SSC CGL TIER-II 12/09/2019

(a) $2\frac{1}{2}$ days

(b) 3 days

(c) $1\frac{1}{2}$ days

(d) 2 days

56. Meera can complete a piece of work in 20 days, Neena in 30 days and Seema in 40 days. Meera and Seema worked together for 4 days and then Meera was replaced by Neena. In how many days, altogether, was the work completed?

SSC CHSL 11/07/2024 (Shift-02)

(a) 14 (b) 16

(c) 18 (d) 20

57. Ram can complete a piece work in 15 days, Rohan in 25 days, and Rohit in 30 days. Rohan and Rohit worked together for 2 days and then Rohit was replaced by Ram. In how many days altogether was the work completed?

SSC CGL 27/07/2023 (Shift-03)

(a) 10 days

(b) 8 days

(c) 12 days

(d) 7 days

58. Mitu can do a piece of work in 12 hours, Titu and Situ together in 2 hours, and Mitu and Situ together in 3 hours. How long will Titu alone take to do it?

SSC CPO 27/06/2024 (Shift-03)

(a) 7 hours

(b) 8 hours

(c) 4 hours

(d) 6 hours

59. Manish, Nakul and Pintoo alone can complete a certain work in 21days, 28 days and 15 days, respectively. Manish and Pintoo started the work together while Nakul joined them after 5 days and worked with them till the completion of the work. For how many days did Nakul work?

SSC CPO 28/06/2024 (Shift-02)

(a) $3\frac{1}{2}$ (b) $2\frac{1}{2}$
(c) $5\frac{1}{2}$ (d) $2\frac{6}{7}$

60. A, B and C can do the same work in 9 days, 12 days and 18 days, respectively. A started the work and worked for 3 days and left. Then, B joined the work and worked for 3 days and left. Then, C joined the work and completed the work. Find the number of days C took to complete the work.

SSC Phase XII 24/06/2024 (Shift-03)

(a) $7\frac{1}{2}$ (b) 8
(c) 7 (d) $8\frac{1}{2}$

61. A, B and C can do a piece of work in 10, 15, 12 days, respectively. A and B worked alternately for 5 days each and left. Then C joined and completed the work. In how many days did C complete the remaining work?

SSC MTS 01/09/2023 (Shift-01)

(a) 4 (b) 1
(c) 2 (d) 3

62. A can finish a work in 15 days, B can finish the same work in 25 days. They work together for 5 days. The rest of the work is finished by A and C in 4 days. Then C alone can finish the work in:

SSC CHSL 02/08/2023 Shift-01

(a) 18 days (b) 24 days
(c) 20 days (d) 21 days

63. A can do 20% of a work in 4 days, and B can do $33\frac{1}{3}$% of the same work in 10 days. They worked together for 9 days and then C completed the remaining work in 6 days. B and C together will complete 75% of the same work in:

SSC CGL 21/07/2023 (Shift-03)

(a) 12 days (b) 9 days
(c) 11 days (d) 10 days

64. X, Y and Z can do a piece of work in 46 days, 92 days and 23 days, respectively. X started the work. Y joined him after 2 days. If Z joined them after 8 days from the beginning, then for how many days did X work?

SSC CGL 11/04/2022 (Shift-02)

(a) 16 (b) 21
(c) 18 (d) 13

65. X, Y and Z can complete a piece of work in 46 days, 92 days and 23 days, respectively. X started the work. Y joined him after 7 days. If Z joined them after 8 days from the beginning then for how many days did Y work?

SSC CGL 19/04/2022 (Shift-02)

(a) $12\frac{5}{7}$ (b) $9\frac{5}{7}$
(c) $10\frac{5}{7}$ (d) $11\frac{5}{7}$

66. X and Y can complete a certain work in 16 days and 24 days, respectively. They work together for 4 days. Z alone completes the remaining work in $10\frac{1}{2}$ days. Y and Z together can complete 7/8th part of the same work in:

SSC MTS 27/10/2021 (Shift-02)

(a) 10 days
(b) 12 days
(c) 8 days
(d) 9 days

67. A and B can do a certain work in 18 days and 30 days, respectively. They work together for 5 days. C alone completes the remaining work in 15 days. A and C together can complete 5/6th part of the same work in:

SSC CGL 13/08/2021(Shift-03)

(a) 6 days (b) 8 days
(c) 9 days (d) 5 days

68. A can complete a work in 20 days, while B can complete the same work in 25 days. Both worked together for 10 days and then C alone completed the remaining work in 10 days. In how many days will A, B and C together complete the same work?

SSC CHSL 05/08/2021 (Shift-01)

(a) 5 Days (b) 10 Days
(c) 12 Days (d) 8 Days

69. A can do 60% of a work in 18 days, while B can do 40% of the same work in 10 days. Both work together for 10 days only. C completed the remaining work in 4 days. In how many days will C complete the same work?

SSC CHSL 05/08/2021 (Shift-02)

(a) 15 (b) 18
(c) 25 (d) 12

70. A and B can complete a piece of work in 15 days, B and C in 30 days and C and A in 45 days. In how many days will they complete the work if they start working together?

SSC CHSL 04/07/2024 (Shift-01)

(a) $16\frac{4}{11}$ (b) $8\frac{3}{11}$
(c) $11\frac{1}{3}$ (d) $11\frac{2}{3}$

71. A and B can together comple piece of work in 18 days. B and can together complete the sam work in 24 days and A and C ca together complete it in 36 days. I how many days can A, B and C working together, complete th piece of work?

SSC MTS 05/07/2022 (Shift

(a) 19 (b) 16
(c) 20 (d) 14

72. A and B can do any work in 4 day B and C can do the same work i 5 days. A and C can do the sam work in 10 days. If A, B, C wor together, in how many days ca they complete the work?

SSC MTS 01/09/2023 (Shift

(a) $3\frac{11}{7}$ days (b) $11\frac{7}{3}$ days
(c) $3\frac{7}{11}$ days (d) $11\frac{3}{7}$ days

73. A and B can finish a work in 1 days, B and C can finish it in 1 days and C and A can finish in 6 days. In how many days A alone ca finish the work?

SSC CGL 18/07/2023 (Shift-0

(a) $\frac{120}{9}$ (b) 12
(c) $\frac{120}{11}$ (d) $\frac{121}{12}$

74. A and B together can complete a piece of work in 25 days, B and C together can complete the same piece of work in 36 days, while C and A together can complete it in 3 days. If A, B, C, and D together ca complete this piece of work in 1 days, then in how many days ca D alone complete this piece o work?

SSC CPO 28/06/2024 (Shift-0

(a) 225 (b) 210
(c) 200 (d) 180

75. Reena and Riya together can complete a piece of work in 36 days. Riya and Geeta together can complete it in 54 days. Reena and Geeta together can complete it in 81 days. In how many days can Reena alone complete the work?

SSC CHSL 10/07/2024 (Shift-0

(a) $82\frac{4}{7}$ days (b) $87\frac{4}{7}$ days
(c) $97\frac{4}{7}$ days (d) $92\frac{4}{7}$ days

76. A and B can complete a piece of work in 12 days. B and C can complete the same work in 15 days and C and A in 10 days. How many days will A take to complete the work by himself?

SSC CHSL 03/07/2024 (Shift-0

(a) $9\frac{1}{8}$ (b) $13\frac{3}{7}$
(c) $16\frac{1}{7}$ (d) $17\frac{1}{7}$

77. R and S can finish a work in 10 days, S and T can finish it in 12 days and T and R can finish in 8 days. In how many days will the work be finished if they all work simultaneously?

SSC CHSL 08/07/2024 (Shift-03)

(a) $\frac{240}{39}$ (b) $\frac{240}{33}$

(c) $\frac{240}{37}$ (d) $\frac{240}{31}$

78. X and Y can complete a piece of work in 18 days, Y and Z can complete the same work in 24 days. If all three of them can complete the same work in 12 days, then in how many days can X and Z complete the work?

SSC CHSL 05/07/2024 (Shift-04)

(a) $14\frac{2}{5}$ days (b) 7 days

(c) $12\frac{3}{5}$ days (d) 5 days

79. Ravi and Sanju together can do a job in 2 days, Sanju and Mahesh can do it in 4 days, while Ravi and Mahesh can do it in 2 days. What is the number of days required for Ravi to do the same job alone?

SSC CPO 28/06/2024 (Shift-01)

(a) 9 days (b) $\frac{8}{3}$ days

(c) $\frac{5}{3}$ days (d) 4 days

80. A and B can do a piece of work in 10 days. B and C can do the same work in 12 days. C and A can do the same work in 15 days. If all the three work together, find the number of days required to complete the work.

SSC Phase XII 25/06/2024 (Shift-03)

(a) 6 (b) 10

(c) 8 (d) 12

81. A and B can complete work in 9 days, while B and C can complete the same work in 18 days. When working together A, B and C, can finish the same work in 8 days. How many days will it take for A and C to complete the work together?

SSC CHSL TIER II 02/11/2023

(a) 11 (b) 14

(c) 12 (d) 13

82. A and B can complete a job together in 12.5 days, B and C can complete the same job together in 18.75 days, while C and A can complete the same job together in 15 days. In how many days will A, B and C together be able to complete the same job alongside D, who is only 40% as efficient as C?

SSC CGL TIER- II 26/10/2023

(a) $9\frac{1}{3}$ (b) $9\frac{17}{27}$

(c) $9\frac{2}{3}$ (d) $9\frac{7}{27}$

83. A and B can do a work in $26\frac{2}{3}$ days. B and C together can complete the same work in 48 days, while A and C together can complete the same work in 30 days. How long (in days) will A alone take to complete 60% of the work?

SSC CGL TIER- II 29/01/2023

(a) 20 (b) 32

(c) 24 (d) 36

84. A and B can do a piece of work in 36 days. B and C can do the same work in 60 days. A and C can do the same work in 45 days. In how many days can A alone complete the same work?

SSC CPO 23/11/2020 (Shift-02)

(a) 90 (b) 45

(c) 60 (d) 120

85. X and Y together can complete a piece of work in 20 days, while Y and Z together can complete it in 24 days. After X worked on it for 10 days and Y for 18 days, Z alone completed the remaining work in another 13 days. X and Z together can complete 75% of the original in:

SSC PHASE-IX 2022

(a) 12 days (b) 9 days

(c) 10 days (d) 8 days

• TYPE – III •
CONCEPT OF ALTERNATE DAYS

86. Rani and Adya, working separately, can finish a task in 12 days and 16 days, respectively. They work in stretches of one day alternately. If Rani starts working first, then the task will be completed in

SSC CGL TIER-II (18/01/2025)

(a) $12\frac{1}{3}$ days (b) $13\frac{2}{3}$ days

(c) $13\frac{1}{3}$ days (d) $12\frac{2}{3}$ days

87. A and B can do a work in 13 days and 26 days, respectively. If they work for a day alternately, starting with A, then in how many days will the work be completed?

SSC CPO 27/06/2024 (Shift-02)

(a) 17 (b) 16

(c) 13 (d) 14

88. Akash and Vikash can complete a work in 40 days and 60 days, respectively. In how many days will the entire work be completed if they work on alternate days, starting with Akash?

SSC CPO 29/06/2024 (Shift-01)

(a) 48 (b) 52

(c) 50 (d) 42

89. Rajan and Rajat can do a work in 64 days and 48 days, respectively. Starting with Rajat, they work on alternate days. In how many days will the work be completed?

SSC CPO 29/06/2024 (Shift-02)

(a) 55 (b) $55\frac{3}{4}$

(c) 54 (d) $54\frac{3}{4}$

90. A and B can do a piece of work separately in 10 days and 8 days, respectively. If they work alternately and A begins the work, in how many days will the work be completed?

SSC Phase XII 26/06/2024 (Shift-04)

(a) 8 (b) 10

(c) 12 (d) 9

91. X and Y can do a piece of work in 18 days and 27 days, respectively. Starting with X, they work on alternate days. The whole number of days to complete the work by X and Y is:

SSC Phase XII 25/06/2024 (Shift-02)

(a) $21\frac{1}{2}$ (b) 24

(c) 20 (d) 21

92. Sarthak and Mohan are working on alternate days in a workshop. Sarthak can complete the work in 20 days while Mohan can finish in 25 days. Sarthak works on the 1st day, Mohan on the 2nd day, and so on. How much time (in days) will they take on alternate basis?

SSC Phase XII 25/06/2024 (Shift-04)

(a) $22\frac{1}{3}$ (b) $22\frac{1}{5}$

(c) 23 (d) $20\frac{1}{5}$

93. Working separately, A and B can complete a work in 15 days and 18 days, respectively. If A starts the work and they work on alternate days, one on each day, then in how many days will the work be completed?

SSC Phase XII 26/06/2024 (Shift-02)

(a) $15\frac{2}{3}$ (b) $17\frac{1}{3}$

(c) $18\frac{2}{3}$ (d) $16\frac{1}{3}$

94. Akshita and Raina are typing a book, but have only one laptop to work upon. They decided that they will work on alternate basis such that Akshita works for the first day, Raina works for the second day, Akshita for the third day and so on. Akshita alone can finish the typing work in 16 days, while Raina will take 24 days if she works alone on the entire book. How many days will they take to finish the typing work if they work on alternate basis?

SSC CPO 04/10/2023 (Shift-02)

(a) 19 days (b) 15 days

(c) 17 days (d) 18 days

95. A work can be completed by P and Q working separately in 12 and 18 days, respectively. But they work on alternate days beginning with P. How many days will it take to complete the work?

SSC MTS 04/09/2023 (Shift-01)

(a) $14\frac{1}{12}$ (b) 15

(c) $14\frac{1}{3}$ (d) $14\frac{1}{4}$

96. Amar can complete a work in 15 days and Prem in 12 days. Starting with Amar, they work on alternate days. In how many days will the work be completed?

SSC CGL 18/07/2023 (Shift-02)

(a) $13\frac{1}{2}$ (b) $12\frac{1}{6}$

(c) $13\frac{2}{5}$ (d) 13

97. A can complete a piece of work in 25 days while B can complete the same work in 30 days. They work on alternate basis, starting with A. Both A and B follow this pattern for 5 days and then A leaves the work. In how many days will B finish the remaining work?

SSC CGL 14/07/2023 (Shift-01)

(a) $24\frac{2}{5}$ (b) $5\frac{2}{5}$

(c) $5\frac{3}{5}$ (d) $24\frac{3}{5}$

98. A and B can finish a work in $5\frac{1}{3}$ days. A alone can finish this work in 8 days. A and B worked on alternate days (starting with B) to finish this work. In how many days will the work be finished?

SSC MTS 06/09/2023 (Shift-02)

(a) 6 days (b) 11 days

(c) $6\frac{1}{3}$ days (d) $11\frac{1}{3}$ days

99. In a factory, Ajay and Vijay work on the same machine to cut diamonds but on alternate hour basis. Ajay works for the first hour and then Vijay works for the second hour and so on. Ajay can complete the work in 6 hours, while Vijay completes it in 16 hours if they work individually. In how much time can they complete the work if they are using the machine on alternate basis?

SSC CGL 08/12/2022 (Shift-02)

(a) 8 hours 30 min

(b) 8 hours

(c) 9 hours

(d) 9 hours 30 min

100. Two persons A and B working separately can sanitise a building in 6 and 10 hours, respectively. They work in stretches of one hour alternately. In how many hours will the work be finished?

SSC CGL 13/12/2022 (Shift-03)

(a) $9\frac{1}{3}$ hours (b) $8\frac{1}{3}$ hours

(c) $6\frac{1}{3}$ hours (d) $7\frac{1}{3}$ hours

101. Avi and Bindu can complete a project in 4 and 12 hours, respectively. Avi begins project at 5 a.m., and they work alternately for one hour each. When will the project be completed?

SSC CHSL 24/05/2022 (Shift- 03)

(a) 9 am. (b) 11 am.

(c) 1 pm. (d) 10 am.

102. A man takes 16 days to complete a project. A woman does the same work in 12 days. They started the work together on alternate days and the man worked on the first day. How much time will they take to complete the work?

SSC CHSL 26/05/2022 (Shift- 02)

(a) $\frac{58}{4}$ Days

(b) $\frac{55}{4}$ Days

(c) $\frac{33}{4}$ Days

(d) $\frac{61}{4}$ Days

103. A, B and C can complete a work in 10, 15 and 20 days, respectively. They work on alternate days such that 1st day A 2nd day B and 3rd day C. Again 4th day A, 5th day B and so on. If they work in the same way, in how many days will the work be completed?

SSC MTS 04/09/2023 (Shift-02)

(a) $13\frac{1}{2}$ (b) 14

(c) $13\frac{1}{4}$ (d) 15

104. If Mohit, Nitu and Soma can complete a piece of work in 5 days, 6 days and 8 days, respectively, then in how many days will the work be completed if they work on alternate days starting with Mohit on first day, then Nitu on second day. then Soma on third day, then Mohit on fourth day and so on.

SSC MTS 14/09/2023 (Shift- 02)

(a) $5\frac{7}{12}$ (b) $7\frac{1}{60}$

(c) $6\frac{1}{12}$ (d) $4\frac{7}{15}$

105. A, B and C can separately complete a work in 20, 25 and 30 days, respectively. If A works on the first day alone, B on second day alone and C on the third day alone, and this sequence goes on further, in how many days will the entire work be finished?

SSC Phase XI 27/06/2023 (Shift-01)

(a) $25\frac{4}{15}$ (b) $24\frac{1}{75}$

(c) $25\frac{1}{75}$ (d) $24\frac{4}{15}$

106. Tushar, Megha, Punam and Richa can complete a piece of work in 10 days, 12 days, 15 days and 18 days, respectively. In how many days will the work be completed if each of them work on alternate days starting with Megha on first day, Punam on second day, Richa on third day, Tushar on fourth day and then again Megha on fifth day and so on.

SSC MTS 05/09/2023 (Shift-02)

(a) 12 (b) 10

(c) 13 (d) 14

107. A can do a piece of work in 24 days and B can do it in 80 days. B works alone for 2 days and A works alone on the 3rd day. This process continues till the work is completed. In how many days will the work be completed?

SSC CHSL 25/05/2022 (Shift- 01)

(a) 42 (b) 45

(c) 48 (d) 44

108. A can complete a piece of work alone in 200 days, while B can complete the same piece of work alone in 100 days. In every three-day cycle, both A and B work on day 1, only A works on day 2, and only B works on day 3. This cycle continues till the work is completed. How many days in all does it take the duo to complete the work?

SSC CPO 27/06/2024 (Shift-01)

(a) $100\frac{1}{3}$ (b) $99\frac{2}{3}$

(c) $100\frac{1}{2}$ (d) 100

109. A, B and C can do a piece of work in 20 days, 30 days and 60 days respectively. If A works daily and on every third day B and C also work with A, then in how many days, will the work be completed?

SSC CPO 03/10/2023 (Shift-01)

(a) 21 days (b) 12 days

(c) 18 days (d) 15 days

110. A, B and C can do a piece of work in 11 days, 20 days and 55 days respectively. How soon can the work be done if A works with B on first day, A works with C on second day and so on?

SSC CPO 05/10/2023 (Shift-03)

(a) 9 days (b) $9\frac{1}{2}$ days

(c) $8\frac{1}{2}$ days (d) 8 days

111. X, Y and Z can complete a work in 5 days, 15 days and 30 days, respectively. In how many days can the work be completed if X is assisted by Y and Z together, on every second day?

SSC CGL 26/07/2023 (Shift-03)

(a) 5 days (b) 4 days

(c) 7 days (d) 6 days

112. P, Q and R can finish a work in 5 days, 10 days, and 15 days, respectively, working alone. P and Q works on first day, P and R works on second day and P and Q works on third day and so on till the work is completed. In how many days the work will be completed?

SSC CGL TIER- II 07/03/2023

(a) $\frac{13}{2}$ (b) $\frac{9}{2}$

(c) $\frac{7}{2}$ (d) $\frac{5}{2}$

113. A, B and C can complete a piece of work separately in 10, 20 and 40 days, respectively. In how many days will the work be completed if A is assisted by both B and C every third day?

SSC CGL 01/12/2022 (Shift-02)

(a) $8\frac{2}{7}$ (b) 9

(c) $10\frac{2}{3}$ (d) 6

114. Ruchi, Khushi and Teju can do a piece of work in 30, 40 and 60 days respectively. In how many days can Ruchi do the work, if she is assisted by both Khushi and Teju on every third day?

SSC CGL 03/12/2022 (Shift-01)

(a) $\frac{550}{12}$ days (b) $\frac{85}{4}$ days

(c) $\frac{71}{2}$ days (d) $\frac{360}{17}$ days

115. A, B and C can do a piece of work in 11 days, 20 days and 55 days respectively. If B works daily and is supported by A and C on alternate days beginning with A, then in how many days will the work be finished?

SSC CGL 06/12/2022 (Shift-01)

(a) 10 (b) $9\frac{1}{3}$

(c) 12 (d) 8

116. A alone can do a work in 11 days. B alone can do the same work in 22 days. C alone can do the same work in 33 days. They work in the following manner:

Day 1: A and B work.
Day 2: B and C work.
Day 3: C and A work.
Day 4: A and B work.

In how many days will the work be completed?

SSC CGL TIER-II (08/08/2022)

(a) 12 days (b) 3 days

(c) 6 days (d) 9 days

117. A and B complete a work in 24 and 30 days, respectively, working 10 hours per day. The work is to be done in two shifts. The morning shift is for 6 hours and the evening shift is for 4 hours. On the first day, A works in the morning and B works in the evening, and they interchange their shifts every day. On which day did the work get completed?

SSC CPO 05/10/2023 (Shift-01)

(a) 24th day (b) 27th day

(c) 30th day (d) 21st day

118. R, S and T can finish a work in 20,15 and 10 days, respectively, R works on all days and S and T work on alternate days with T starting the work on the first day. In how many days is the work finished?

SSC CGL 24/07/2023 (Shift-04)

(a) $\frac{61}{7}$ (b) $\frac{50}{7}$

(c) $\frac{52}{7}$ (d) $\frac{54}{7}$

119. A and B are equally efficient, and each can individually complete a piece of work in 36 days, if none takes any holiday. A and B started working together on this piece of work, but A took a day off after every five days of work, while B took a day off after every seven days of work. If they had started work on 1 July 2021, on which date was the work completed?

SSC CPO 05/10/2023 (Shift-03)

(a) 19 July 2021
(b) 20 July 2021
(c) 22 July 2021
(d) 21 July 2021

120. A and B are equally efficient, and each could individually complete a piece of work in 30 days, if none took any holiday. A and B started working together on this piece of work, but A took a day off after every four days of work, while B took a day off after every five days of work. If the duo had started work on 01 August 2022, on which date was the work completed?

SSC CGL 18/07/2023 (Shift-03)

(a) 19 August 2022
(b) 18 August 2022
(c) 16 August 2022
(d) 17 August 2022

121. Two men A and B, each working alone by working 12 hours per day, can complete a work in 20 days. For execution of the work, it was decided that A and B would be working for 8 and 6 hours per day, respectively, on alternate days starting with A. If it takes x days and y hours to complete the work then (x, y) is:

SSC MTS 05/10/2021 (Shift-01)

(a) (34, 4) (b) (33, 4)

(c) (33, 2) (d) (34, 2)

122. Ratnesh and Vineet worked on alternate days, starting with Ratnesh. The entire work got completed in $54\frac{3}{4}$ days. If Ratnesh alone can finish the work in 48 days, then in how many days can Vineet alone do the work?

SSC CHSL TIER-II (18/11/2024)

(a) 62 (b) 64

(c) 60 (d) 66

123. A man and woman working on alternate days can finish a work in 15 days if the man works on the first day. The same work is finished in 14.5 days if they work on alternate days and if the woman starts on the first day. The work will be finished by a man alone in ______ days.

SSC MTS 08/09/2023 (Shift-01)

(a) 22 (b) 15

(c) 21 (d) 25

124. To do a certain work, Ajay and Bharat work on alternate days, with Bharat starting the work on the first day. Ajay can finish the work alone in 32 days. If the work gets completed in exactly 8 days, then Bharat alone can finish 7 times the same work in ____ days.

SSC CGL 14/07/2023 (Shift-04)

(a) $\frac{28}{8}$ (b) 4

(c) $\frac{32}{7}$ (d) 32

125. To do a certain work, A and B work on alternate days with B beginning the work on the first day. A alone can complete the same work in 24 days. If the work gets completed in $11\frac{1}{3}$ days, then B alone can complete $\frac{7}{9}$ part of the original work in:

SSC CGL 13/08/2021(Shift-01)

(a) $5\frac{1}{2}$ days (b) 4 days

(c) $4\frac{1}{2}$ days (d) 6 days

126. Aman and Rajan are working at a construction site. In some engineering experiment, Aman is constructing a wall, while Rajan is demolishing that wall. Aman can completely build the wall in 15 days, while Rajan will take 20 days to completely demolish the wall. In how many days will the complete wall be built for the first time if they work on alternate days, with Aman working on the 1st day?

SSC Phase XII 21/06/2024 (Shift-03)

(a) 57 (b) 117

(c) 113 (d) 120

◆ TYPE – IV ◆
CONCEPT OF LEFTING THE WORK

127. A can do a piece of work in 36 days, while B can do it in 48 days. B worked on it for 12 days and leaves it. How many days will A take to finish the remaining work?

SSC MTS 01/09/2023 (Shift-02)

(a) 27 (b) 21

(c) 28 (d) 32

128. A can do a piece of work in 10 days and B can do it in 15 days. They work together for 2 days and then A leaves. How long will B take to finish the remaining work?

SSC MTS 08/09/2023 (Shift-03)

(a) 5 days (b) 10 days
(c) 12 days (d) 22 days

129. P and Q can do a work together in 30 days. Q and R can do the same work together in 24 days and R and P together in 20 days. They started the work together, but Q and R left after 10 days. How many more days will P take to finish the remaining work?

SSC CPO 03/10/2023 (Shift-02)

(a) 23 days (b) 19 days
(c) 21 days (d) 18 days

130. Rohan alone can complete a work in 12 days and Hari alone can complete it in 16 days. They both work for 3 days and then Rohan leaves the work. After that Hari works alone and completes the work. In how many days will the total work be completed.

SSC CHSL 09/07/2024 (Shift-01)

(a) 9 days (b) $12\frac{1}{3}$ days
(c) $12\frac{2}{3}$ days (d) 12 days

131. P can do a piece of work in 30 days and Q in 40 days. They work together for 4 days and then Q leaves. The number of days taken by P to finish the remaining work is:

SSC CPO 28/06/2024 (Shift-03)

(a) 23 days (b) 28 days
(c) 30 days (d) 7 days

132. A and B can do a work in 15 days and 30 days, respectively. They start working together, but A leaves after 3 days. How much time will B take to complete the remaining work?

SSC Phase XII 20/06/2024 (Shift-03)

(a) 21 days (b) 28 days
(c) 24 days (d) 32 days

133. Raja and Rocky together can complete painting work in 5 days. Together they both start painting, but after 2 days, Rocky falls sick and leaves the work. If Raja completes the remaining painting in 4 days, find the number of days in which Rocky alone can do the work.

SSC CGL 18/07/2023 (Shift-02)

(a) 12 days (b) 15 days
(c) 20 days (d) 10 days

134. A and B can complete a work in 36 days and 45 days respectively. They worked together for 2 days and then A left the work. In how many days will B complete the remaining work?

SSC CPO 10/11/2022 (Shift-03)

(a) 41.5 (b) 40
(c) 41 (d) 40.5

135. X can complete half of the work in 20 days and Y can do one-fifth of the same work in 10 days. X started the work and left after 8 days. Then Y took over to complete the remaining work. The total number of days taken by them to complete the work is:

SSC CHSL 11/08/2021 (Shift-01)

(a) 48 days
(b) 40 days
(c) 60 days
(d) 50 days

136. B and C can complete a work alone in 10 days and 30 days respectively. They began the work together but B left the work after some days and C completed the remaining work in 10 days. After how many days from the beginning B left the work?

SSC MTS 15/06/2023 (Shift-02)

(a) 4 days
(b) 6 days
(c) 8 days
(d) 5 days

137. A can complete work in 25 days and B can complete the same work in 20 days. They started the work together but B left after 4 days and A continued to work. In how many days will the entire work be completed?

SSC CGL 18/04/2022 (Shift-02)

(a) 22 (b) 25
(c) 20 (d) 28

138. A, B and C can individually complete a work in 24, 15 and 12 days respectively. B and C started the work and left after working for 3 days, how many days will A take to complete the remaining work?

SSC CGL 03/03/2020 (Shift-01)

(a) $15\frac{1}{2}$ (b) 18
(c) $13\frac{1}{5}$ (d) 11

139. Shivam can do a piece of work in 6 days and Vivek in 24 days. They started work together but Shivam left the work 3 days before its completion. In how many days was the work completed?

SSC Phase-XI 30/06/2023 (Shift-03)

(a) $7\frac{4}{5}$ days (b) $7\frac{2}{5}$ days
(c) $7\frac{3}{5}$ days (d) $7\frac{1}{5}$ days

140. A and B can individually complete a piece of work in 18 days and 30 days, respectively. A and B started working together, but A left $16\frac{2}{3}$ days before the work is completed and B alone completed the rest of the work. For how many days did A work?

SSC CGL 20/07/2023 (Shift-01)

(a) 4 (b) 5
(c) 6 (d) 3

141. P, Q and R, when working individually, can complete a job in, respectively, 36 days, 48 days and 144 days. P, Q and R start working together. P leaves the job 12 days before completion and Q leaves the job 8 days before completion. R works from the beginning till the end of the job. Determine the total number of days taken to complete the job.

SSC CPO 03/10/2023 (Shift-01)

(a) 30 days (b) 24 days
(c) 27 days (d) 25 days

142. Benny can do a piece of work in 24 days. Chetan and David can do the same work individually in 36 and 48 days respectively. All of them begin the work together. However, Benny leaves the work 4 days before the completion of work and Chetan leaves the work 10 days before the completion of the work. David worked till the end and completed the work. Find the number of days in which the work was completed.

SSC CGL 27/07/2023 (Shift-02)

(a) 16 (b) 20
(c) 18 (d) 15

143. P, Q and R can complete a work alone in 12, 15 and 20 days respectively. They started the work together. P left the work 8 days before the work was completed and Q left the work 5 day's after P had left. R completed the remaining work alone. How many days will he required to complete the whole work?

SSC CHSL 15/03/2023 (Shift-04)

(a) $\frac{32}{3}$ days (b) 10 days
(c) $\frac{28}{3}$ days (d) $\frac{25}{3}$ days

144. Aarif, Arun and Abraham can do a work in 12, 20 and 24 days, respectively. They all begin together. Aarif leaves the work 1 day, Arun 3 days and Abraham 4 days before its completion. In how many days is the work finished?

SSC CGL 12/12/2022 (Shift-04)

(a) 8 (b) 10
(c) 11 (d) 9

145. A alone can do a work in 14 days. B alone can do the same work in 28 days. C alone can do the same work in 56 days. They started working together and completed the work such that B was not working on last 2 days and A did not work in last 3 days. In how many days (total) was the work completed?

SSC CGL TIER-II (08/08/2022)

(a) $\frac{72}{7}$ days (b) $\frac{87}{7}$ days
(c) $\frac{79}{7}$ days (d) $\frac{65}{7}$ days

146. A, B and C separately can do a piece of work in 18, 36 and 54 days respectively. They started the work together, but B and C left 5 days and 10 days respectively before the completion of the work. In how many days will the work be completed?

SSC CGL TIER-II 18/11/2020

(a) 13 (b) 12
(c) 14 (d) 15

147. A can do $\frac{1}{5}$ of a piece of work in 20 days, B can do 30% of the same work in 36 days, while C can do 80% of the same work in 160 days. B and C together started and worked for x days. After x days B left the work, and A joined C and both completed the remaining work in $(x - 41)$ days. If the ratio between the work done by (B + C) together to the work done by (A + C) together is 19 : 6, then what fraction of the same work can be completed by C alone in $2x$ days?

SSC CPO 05/10/2023 (Shift-01)

(a) $\frac{57}{100}$ (b) $\frac{19}{25}$
(c) $\frac{13}{25}$ (d) $\frac{6}{25}$

◆ TYPE – V ◆
CONCEPT OF EFFICIENCY

148. Ramesh does half as much work as Parul in $\frac{4}{5}$ of the time. If together Ramesh and Parul take 24 days to complete the work, then how much time will Parul take to do it?

SSC CPO 03/10/2023 (Shift-03)

(a) 37 days (b) 38 days
(c) 41 days (d) 39 days

149. Babita is 1.25 times as efficient as Deepak. Working together the duo can complete a piece of work in 40 days. In how many days can Deepak alone complete the same piece of work?

SSC CHSL 03/08/2023 (Shift-02)

(a) 84 (b) 90
(c) 96 (d) 100

150. Sapna is double efficient as compared to Rakesh. If they both work together on a project and complete it in 48 days, then the number of days in which Sapna alone can complete the project is:

SSC CPO 29/06/2024 (Shift-02)

(a) 72 (b) $69\frac{1}{2}$
(c) 68 (d) 52

151. Teena does half of a task in 6 days. Later, with shyam's help, she completes the ramaining work in 4 days. Shyam alone can finish the entire work in:

SSC CHSL 11/07/2024 (Shift-03)

(a) 21 days (b) 24 days
(c) 18 days (d) 12 days

152. Joy completed the school project in 15 days. How many days will Tim take to complete the same work if he is 25% more efficient than Joy?

SSC CHSL 03/07/2024 (Shift-01)

(a) 12 days (b) 10 days
(c) 16 days (d) 8 days

153. Nirmal completed the school project in 45 days How many days will Amit take to complete the same work if he is 25% more efficient than Nirmal?

SSC CHSL 11/07/2024 (Shift-01)

(a) 30 (b) 25
(c) 38 (d) 36

154. Arvind works 4 times as fast as Suresh. If Suresh can complete a work in 20 days independently, then find the number of days in which Arvind and Suresh can together finish the work.

SSC CPO 27/06/2024 (Shift-02)

(a) 6 (b) 3
(c) 5 (d) 4

155. Tarun is twice as good as Tripti in doing a work. Together, they can complete the work in 16 days. In how many days can Tripti alone complete the same work?

SSC CPO 28/06/2024 (Shift-03)

(a) 24 (b) 48
(c) 25 (d) 50

156. P is two times efficient than Q. P is able to complete a piece of work in 40 days less than Q. Working together, the whole number of days taken by them to complete the work is: (Round off to the nearest integer)

SSC CGL 14/07/2023 (Shift-02)

(a) 26 (b) 25
(c) 27 (d) 28

157. X alone can complete a work in 18 days and Y alone can do the same work in half time of the time taken by X. Working together what part of the same work they can complete in a day?

SSC CHSL 09/03/2023 (Shift-03)

(a) $\frac{1}{3}$ (b) $\frac{1}{5}$
(c) $\frac{1}{4}$ (d) $\frac{1}{6}$

158. Raj alone can complete a work in 20 days and Pratap alone can complete the same work in half of the time taken by Raj. In how many days, will both together complete $\frac{3}{5}$ part of the total work?

SSC CHSL 10/03/2023 (Shift-01)

(a) 10 days (b) 4 days
(c) 6 days (d) 8 days

159. A and B together can complete a piece of work in 48 days. A is 4 times as efficient as B. In how many days B alone can complete the work?

SSC CGL TIER- II 06/03/2023

(a) 220 Day (b) 240 Day
(c) 120 Day (d) 320 Day

160. R can finish a work in 6 days if he works 10 hours a day. S can finish it in 5 days if he works 8 hours a day. If both start a work and work daily for 6 hours, the work will be finished in days.

SSC CHSL 08/07/2024 (Shift-03)

(a) 3 (b) 4
(c) 5 (d) 6

161. If 6 engineers can complete a work in 5 days and 5 skilled workers can complete the same work in 7 days, then the time taken (in days) to complete the same work by 7 engineers and 4 skilled workers will be

SSC CHSL 09/07/2024 (Shift-03)

(a) $2\frac{64}{70}$ (b) $3\frac{64}{73}$
(c) $2\frac{64}{73}$ (d) $2\frac{65}{73}$

162. To finish a work, P takes half of the number of days required by Q to finish it. If they together can finish the work in 36 days, then in how many days Q alone can finish the work?

SSC CHSL 10/07/2024 (Shift-01)

(a) 84 (b) 60
(c) 24 (d) 108

163. A work can be done by a man and a woman in 12 days and 8 days, respectively. In how many days will the work be done by 6 men and 4 women?

SSC CHSL 05/07/2024 (Shift-03)

(a) $\frac{1}{2}$ (b) 1
(c) $\frac{3}{4}$ (d) 2

164. If 4 men or 6 boys can finish a piece of work in 20 days, then in how many days can 6 men and 11 boys finish the same work?

SSC CPO 03/10/2023 (Shift-03)

(a) 5 days (b) 7 days
(c) 8 days (d) 6 days

165. If 2 men or 4 women can build a wall in 34 days, in how many days can 6 men and 5 women build the same wall?

SSC CPO 05/10/2023 (Shift-01)

(a) 8 days (b) 16 days
(c) 24 days (d) 12 days

166. Working 5 hours a day, A can complete a task in 8 days and working 6 hours a day, B can finish the same task in 10 days. Working 8 hours a day, they can jointly complete the task in _____.

SSC CGL 17/07/2023 (Shift-02)

(a) 5 days (b) 3 days
(c) 4.5 days (d) 6 days

167. A alone can finish a work in 15 days. A works only for the first two days and last two days. The rest work is done by B and the work is completed in 20 days. In how many days A and B together can finish the work?

SSC CGL 18/07/2023 (Shift-03)

(a) $\frac{90}{8}$ (b) $\frac{80}{7}$
(c) $\frac{80}{9}$ (d) $\frac{70}{8}$

168. After working alone for 12 days, Reena finds that only 10 percent of the work is completed. She employs Priya who is 40 percent more efficient than Reena. How many more days will they together take to complete the remaining work?

SSC MTS 15/06/2023 (Shift-01)

(a) 30 days (b) 50 days
(c) 45 days (d) 40 days

169. A can do a piece of work in 25 days. After working for 5 days, he took help of B and completed the work in 8 days. If both A and B had worked together from the beginning, in how many days would they have completed the work?

SSC Phase XII 25/06/2024 (Shift-04)

(a) 14 (b) 12
(c) 10 (d) 15

170. Naman does half of the work as Gagan in $\frac{4}{5}$ time. If together they take 16 days to complete a piece of work, then how long will Gagan take to complete the work?

SSC CGL 05/12/2022 (Shift-01)

(a) 23 days (b) 24 days
(c) 25 days (d) 26 days

171. P can do one-fourth piece of some work in 18 days. She completed 37.5% of that work and left it.Q completed the remaining work in 40 days. Working together they will complete $\frac{17}{48}$ part of the same work in:

SSC PHASE-IX 2022

(a) 10 days (b) 8 days
(c) 12 days (d) 6 days

172. To do a certain work, efficiencies of A and B are in the ratio 7 : 5. Working together, they can complete the work in $17\frac{1}{2}$ days. In how many days, will B alone complete 50% of the same work?

SSC CGL 23/08/2021(Shift-02)

(a) 50 (b) 30
(c) 42 (d) 21

173. Amita can build a room in the same amount of time that Bina and Sita working together can build. If Amita and Bina together could do it in 25 days and Sita alone in 35 days, then how many days are required for Bina alone to do the same work?

SSC CPO 29/06/2024 (Shift-01)

(a) 152 days (b) 175 days
(c) 165 days (d) 180 days

174. Robert takes twice as much time as Tom and thrice as much time as Jeorge to complete a work. If working together, they can complete it in 23 hours, then find the time that Tom will take to complete the work.

SSC CPO 05/10/2023 (Shift-02)

(a) 39 hours (b) 46 hours
(c) 69 hours (d) 11 hours

175. A takes twice as much time as B and thrice as much time as C to finalise a task. Working together, they can complete the task in 8 days. The time (in days) taken by A, B and C, respectively, to complete the task is:

SSC CGL 02/12/2022 (Shift-02)

(a) 42, 21, 14 (b) 60, 30, 20
(c) 54, 27, 18 (d) 48, 24, 16

176. A and B can do a piece of work in 18 days. B and C together can do it in 30 days. If A is twice as efficient as C then in how many days can B alone do the work?

SSC CGL TIER-II 18/11/2020

(a) 80 (b) 100
(c) 75 (d) 90

177. The ratio of work efficiency of A, B and C is 2 : 5 : 3. Working together, they can complete a work in 27 days. In how many days will B and C together complete $\frac{4}{9}$ parts of the work?

SSC CGL 04/06/2019 (Shift-01)

(a) 27 days (b) 15 days
(c) $17\frac{1}{7}$ days (d) 24 days

178. The ratio of work efficiency of A, B and C is 2 : 3 : 5. Working together, they can complete a work in 6 days. In how many days will A complete 20% of the work?

SSC CGL 12/06/2019 (Shift-02)

(a) 8 (b) 5
(c) 6 (d) 4

179. A can do a certain piece of work in 2.4 times the number of days in which B and C together can do it. If A and B together can do the same piece of work in 27 days and C alone can do it in 75 days, then how many days will B take to do this piece of work alone?

SSC CPO 05/10/2023 (Shift-02)

(a) 42 days (b) 54 days
(c) 48 days (d) 45 days

180. A & B can do a piece of work in 10 days. B and C can do the same work in 15 days. If A is twice as good a workman as C, find in what time B alone can do the work (in days).

SSC MTS 12/09/2023 (Shift- 03)

(a) 25 (b) 30
(c) 10 (d) 20

181. A can do a certain piece of work in 1.5 times the number of days in which B and C together can do it. If A and B together can do the same piece of work in 30 days and C alone can do it in 120 days, then how many days will B take to do this piece of work alone?

SSC CGL 24/07/2023 (Shift-02)

(a) 75 (b) 45
(c) 60 (d) 50

182. To do a certain task X would take 3 times as long as Y and Z together; and Z would takes 4 times as long as Y and X together. Three of them together can complete the task in 10 days. How much time is taken by X and Z to complete the task?

SSC CPO 09/11/2022 (Shift-01)

(a) $18\frac{2}{9}$ days (b) $20\frac{1}{9}$ days
(c) $20\frac{1}{9}$ days (d) $22\frac{2}{9}$ days

183. A alone can do 2/5 of a work in 12 days. B is 25 percent more efficient than A. C alone can do the same work in 12 days less than B. D is 25 percent less efficient than C. If they all work together, then the work will be completed in how many days?

SSC CGL TIER-II (08/08/2022)

(a) $\frac{240}{53}$ (b) $\frac{180}{43}$
(c) $\frac{300}{47}$ (d) $\frac{200}{57}$

184. To do a certain work, A is 40% more efficient than B. Working together, they can do the same work in 15 days. A started the work and left after 15 days. B and C together completed the remaining work in next 10 days. C alone can do one third of the original work in:

SSC PHASE-IX 2022

(a) 36 days (b) 21 days
(c) 30 days (d) 24 days

185. A can complete a work in $11\frac{1}{2}$ days. B is 25% more efficient than A and C is 50% as efficient as B. Working together A, B and C will complete the same work

SSC CGL 24/08/2021(Shift-01)

(a) 8 days (b) 4 days
(c) 3 days (d) 5 days

186. A does a work in 15 days. B is 25% more efficient than A and C is 40% more efficient than B. A and C work together for 3 days and then C leaves. A and B together complete the remaining work:

SSC CGL TIER-II 15/11/2020

(a) $2\frac{1}{2}$ days (b) $3\frac{1}{2}$ days
(c) 4 days (d) 3 days

187. A can complete a work in 40 days. B is 25% more efficient than A and C is 28% more efficient than B. They work together for 5 days. How many days will B alone take to complete the remaining work?

SSC CGL 03/03/2020 (Shift-02)

(a) $20\frac{3}{4}$ (b) $16\frac{1}{5}$
(c) $16\frac{3}{5}$ (d) $20\frac{1}{2}$

188. To complete a certain work, X is 40% more efficient than Y and Z is 40% less efficient than Y. Working together, they can complete the work in 21 days. Y and Z worked together for 35 days. In how many days will X alone complete the remaining work?

SSC CGL 05/03/2020 (Shift-03)

(a) 8 (b) 6

(c) 5 (d) 4

189. A's efficiency is twice that of B's. A can work only for 8 hours a day while B can work for 12 hours a day. If A can finish a work in 12 days, in how many days can B finish the same work?

SSC CGL 14/07/2023 (Shift-03)

(a) 8 (b) 10

(c) 16 (d) 12

190. P and Q can do a job in 24 days, Q and R can do it in 30 days, while P and R can do it in 40 days. X is four times as efficient as P, Y is half as efficient as Q, and Z is 2.5 times as efficient as R. Determine the number of days required to complete the same job if X, Y and Z work together.

SSC CGL 20/07/2023 (Shift-03)

(a) 9 (b) 12

(c) 8 (d) 10

191. A, B and C can finish a work in 15 days working alternately in the same order. The efficiency of A is the same as that of B, and the efficiency of C is equal to that of A. In how many days will the work be finished if they work alternately in the order C, A and B?

SSC CGL 26/07/2023 (Shift-03)

(a) 12 (b) 14

(c) 15 (d) 16

192. Abha and Anuj working together completed a job in $\frac{40}{9}$ days. If Abha had worked twice as efficiently as she actually did and Anuj had worked $\frac{1}{3}$ of his actual efficiency, then the work would have been completed in $\frac{60}{17}$ days. Find the time Abha would take to complete the work alone.

SSC CGL 09/12/2022 (Shift-03)

(a) 10 days

(b) 8 days

(c) 12 days

(d) 6 days

193. A, B and C together can complete a work in x, 30 and 45 days, respectively. B and C worked together for 6 days. The remaining work was completed by A alone in 12 days. The value of x is:

SSC CHSL 19/04/2021 (Shift-01)

(a) 18 (b) 20

(c) 24 (d) 15

◆ TYPE – VI ◆
MDH CONCEPT

194. 55 Workers can finish a work in 16 days. For finishing the same work in 10 days, how many more workers are required?

SSC CHSL 10/07/2024 (Shift-01)

(a) 68 (b) 33

(c) 88 (d) 31

195. 47 masons can dig a 35 m long trench in one day. How many masons should be employed for digging a 105m long trench of the same type in one day?

SSC CHSL 02/07/2024 (Shift-02)

(a) 94 (b) 141

(c) 125 (d) 70

196. If 7 men working 8 hours a day for 5 day's can complete a work, then how many men are required to complete the same work if they work 10 hours a day for 7 days?

SSC MTS 08/09/2023 (Shift-03)

(a) 5 (b) 3

(c) 4 (d) 6

197. 16 men can dig a ditch 24 m long in 18 days, working 6 hours a day. How many more men should be engaged to dig a similar ditch 42 m long in 9 days, each man now working 12 hours per day?

SSC Phase-XI 30/06/2023 (Shift-03)

(a) 14 (b) 10

(c) 12 (d) 9

198. Eighteen persons working 8 hours a day can complete 3 units of work in 10 days. How many days are required by 25 persons to complete 5 units of work working 6 hours a day?

SSC CGL 13/08/2021(Shift 02)

(a) 20 (b) 12

(c) 16 (d) 10

199. 18 men can complete $\frac{1}{5}$ of a work in 10 days. How many people are required to complete $\frac{2}{5}$ of the same work in 5 days?

SSC CHSL 03/07/2024 (Shift-02)

(a) 90 (b) 36

(c) 72 (d) 54

200. 30 men working 5 hours a day can do work in 18 days. In how many days will 20 men working 7 hours a day do the same work?

SSC CHSL 09/07/2024 (Shift-02)

(a) $16\frac{5}{7}$ (b) $13\frac{1}{7}$

(c) $19\frac{2}{7}$ (d) $11\frac{3}{7}$

201. Twelve men working for 9 hours a day complete a piece of work in 24 days. In how many days can 8 men working for 12 hours a day complete the same piece of work?

SSC CHSL 02/07/2024 (Shift-01)

(a) 24 days (b) 21 days

(c) 27 days (d) 28 days

202. Eight laborers working 10 hours a day completed a work in 18 days. If only 5 laborers are working, then in how many hours a day should they work to finish the work in 24 days?

SSC Phase XII 20/06/2024 (QShift-03)

(a) 9 hours (b) 10 hours

(c) 8 hours (d) 12 hours

203. 30 persons working 10 hours a day can do 5 units of work in 12 days. How many people are required to do 8 units of that work in 16 days if they work for 8 hours a day?

SSC Phase XII 26/06/2024 (Shift-03)

(a) 47 (b) 38

(c) 45 (d) 30

204. A group of 25 tourists consume 5 containers of food in 8 days in a hotel. How many containers will be required for 10 tourists to eat for 16 days?

SSC Phase XII 24/06/2024 (Shift-02)

(a) 6 (b) 3

(c) 5 (d) 4

205. 36 persons can do a work in 10 days, working 6 hours a day. In how many days will 24 persons, working 9 hours a day complete the work?

SSC Phase XII 25/06/2024 (Shift-02)

(a) 4 (b) 10

(c) 6 (d) 8

206. 36 equally efficient workers can paint 25 identical walls in 48 days. In how many days can 45 such workers paint 60 such walls?

SSC CPO 04/10/2023 (Shift-03)

(a) 91.96 days (b) 92.16 days

(c) 92.36 days (d) 91.16 days

207. 100 workers working 8 hours a day can dig a canal 2000 metres long in 25 days. Find the number of workers required to dig a similar canal of 2800 metres long in 32 days working 5 hours a day.

SSC MTS 12/09/2023 (Shift-01)

(a) 165 (b) 170

(c) 175 (d) 180

208. In a camp of 70 boys, there are food provisions for 36 days. If 50 boys join the camp, then how many days will the provisions last?

SSC CHSL 08/08/2023 Shift-02

(a) 25 days (b) 24 days

(c) 21 days (d) 18 days

209. In an army camp, there is food provision for 500 cadets for 25 days. If 125 more persons join the army camp on the first day itself, then for how many days will the provision last?

SSC CHSL 08/08/2023 (Shift-03)

(a) 20 (b) 15

(c) 10 (d) 25

210. 30 men can complete a work in 12 days. After 6 days, 24 more men joined them. How many days will they now take to complete the remaining work?

SSC CGL 18/07/2023 (Shift-01)

(a) $3\frac{1}{3}$ days (b) $3\frac{2}{3}$ days

(c) $3\frac{1}{2}$ days (d) $2\frac{1}{3}$ days

211. 10 men can do a work in 25 days. After 12 days of work, 3 more men were engaged to finish the work. The number of days required to complete the remaining work is:

SSC CGL 18/07/2023 (Shift-01)

(a) 10 (b) 8
(c) 6 (d) 12

212. Working for 10 hours per day, 6 men can build a wall in a certain number of days. By working for how many hours per day can 12 men build the wall in the same days?

SSC CGL TIER- II 07/03/2023

(a) 7 hours 30min
(b) 5 hours
(c) 20 hours
(d) 10 hours

213. A group of men committed to completing a task in 20 days. The work was completed in 40 days because 5 workers did not come for work. Determine the number of men who originally agreed to do the work?

SSC CPO 11/11/2022 (Shift-01)

(a) 15 (b) 10
(c) 12 (d) 18

214. A work can be completed by N men in 15 days. 5 men leave the work after 3 days. The remaining work was completed in 18 days. What is the value of N?

SSC MTS 20/07/2022 (Shift-02)

(a) 18 (b) 21
(c) 15 (d) 12

215. To finish a work in 12 days, 8 workers are engaged. After 2 days, due to some urgency, the work is to be finished in next 2 days. How many more workers are to be engaged now to finish it on time?

SSC CHSL 04/07/2024 (Shift-03)

(a) 30 (b) 32
(c) 36 (d) 40

216. 18 workers can complete a piece of work in 96 days. They start working together and after 26 days 10 more workers join them. In how many days in all will the work be completed?

SSC CPO 27/06/2024 (Shift-03)

(a) 69 (b) 71
(c) 72 (d) 70

217. A hostel had food provision for 300 students for a month. After 20 days, 50 students left the hostel. How long would the remaining food last? (1 month = 30 days)

SSC CPO 29/06/2024 (Shift-02)

(a) 10 days (b) 14 days
(c) 12 days (d) 16 days

218. A work can be finished by 8 men in 10 days working 6 hours a day or same can be finished by 20 qualified workers in 6 days working 8 hours a day. 2 men and 4 qualified workers work simultaneously 10 hours a day, the work will be finished in _____ days.

SSC Phase XII 25/06/2024 (Shift-02)

(a) 9 (b) 10
(c) 12 (d) 8

219. In an office, 75 employees can finish a project in 60 days. After few days, 15 employees left the job and the project was completed in 65 days. After how many days did the 15 employees leave?

SSC CPO 04/10/2023 (Shift-02)

(a) 40 days (b) 50 days
(c) 45 days (d) 30 days

220. (N + 18) persons, each working for 7.5 hours a day, can complete 48% of a work in 20 days. (N + 12) persons can complete the remaining work in 30 days, if each of them works for 6.5 hours per day. Determine the value of N.

SSC CGL 19/07/2023 (Shift-01)

(a) 18 (b) 16
(c) 20 (d) 22

◆ TYPE – VII ◆
CONCEPT OF MWC

221. 20 men can complete a piece of work in 40 days, and 40 women can do the same work in 60 days. If 10 men and 20 women work together, then in how many days will the work be completed?

SSC MTS 04/09/2023 (Shift-02)

(a) 40 (b) 50
(c) 60 (d) 48

222. 15 men can complete a work in 25 days, and 25 women can complete the same work in 40 days. If all the 15 men and 25 women work together, in how many days will the work get completed?

SSC CGL 17/07/2023 (Shift-02)

(a) $15\frac{5}{13}$ days (b) $10\frac{5}{13}$ days
(c) $15\frac{5}{12}$ days (d) $15\frac{4}{13}$ days

223. 15 men and 25 women can complete a piece of work in 9.6 days. If 16 women can complete the same work in 27 days, find the number of days in which 16 men can complete the same work.

SSC CGL 17/07/2023 (Shift-01)

(a) 22.50 (b) 20.25
(c) 19.20 (d) 21.60

224. Work done by 8 men is completed in 10 days. The same work can be completed in 12 days when done by 10 women. How many days will it take to complete when 4 men and 4 women are employed to perform the same job?

SSC CGL 19/07/2023 (Shift-03)

(a) 12 (b) 6
(c) 10 (d) 8

225. 10 women can do a work in 6 days and 6 men can do the same work in 5 days. If all these men and women work together, then how many days will they take to finish this work?

SSC CGL 19/07/2023 (Shift-03)

(a) $2\frac{8}{11}$ (b) $4\frac{6}{11}$
(c) $1\frac{2}{11}$ (d) $3\frac{4}{11}$

226. 2 men can finish a work in 6 days and 3 women can finish the same work in 4 days. In how many days will the work be finished by 1 man and 2 women, working together every day?

SSC CGL 25/07/2023 (Shift-03)

(a) 4 (b) 6
(c) 8 (d) 9

227. 12 men can do a work is 8 days while 4 boys can do it in 40 days. In how many days 9 boys and 3 men together will complete the same work ?

SSC CHSL 14/03/2023 (Shift-02)

(a) 10 days (b) $\frac{280}{13}$ days
(c) $\frac{80}{7}$ days (d) $\frac{260}{17}$ days

228. 4 men and 7 women can do a work in 8 days. 7 men and 4 women can do the same work in 5 days. Find the number of days in which 8 women can finish the work ?

SSC CHSL 16/03/2023 (Shift-01)

(a) 60 days (b) 55 days
(c) 40 days (d) 45 days

229. If 6 women can complete a work in 3 days, and 9 girls can complete the same work in 2 days, then find the time taken to complete the same work by 8 women and 6 girls?

SSC CGL 02/12/2022 (Shift-01)

(a) 3 days (b) 4 days
(c) 6 days (d) $\frac{9}{7}$ days

230. 8 men and 12 women finish a job in 4 days. While 6 men and 14 women in 5 days. In how many days will 20 women finish the job?

SSC CPO 11/11/2022 (Shift-02)

(a) 10 (b) 20
(c) 30 (d) 15

231. Sixteen men can complete a work in 8 days. Eight men and nine women working together can complete the same work in 10 days. In how many days will 20 women complete this work?

SSC CGL 05/03/2020 (Shift-03)

(a) 13 (b) 12
(c) 9 (d) 11

232. 3 men can finish a work in 10 days, 4 women can finish it in 12 days and 10 qualified workers can finish it in 6 days. In how many days is the work finished by 4 men, 4 women and 4 qualified workers, working together every day?

SSC Phase XII 21/06/2024 (Shift-02)

(a) $\frac{30}{19}$ (b) $\frac{45}{17}$
(c) $\frac{60}{19}$ (d) $\frac{60}{17}$

233. 4 men and 8 women complete a job in 10 days and 5 men and 24 women complete the same work in 4 days. In how many days will 1 man and 1 women complete the same work?

SSC CHSL 07/08/2023 (Shift-01)

(a) $63\frac{1}{3}$ (b) $69\frac{7}{9}$
(c) $67\frac{1}{3}$ (d) $62\frac{2}{9}$

234. 15 men and 21 women, working together, can do a job in 56 days, while 12 men and 24 women, working together, can do the same job in 64 days. In how many days can the same job be done by 18 men and 24 women, working together?

SSC CGL 17/07/2023 (Shift-04)

(a) $47\frac{6}{19}$ (b) $47\frac{5}{19}$
(c) $47\frac{9}{19}$ (d) $47\frac{3}{19}$

235. A man and a woman can finish a work together in half the time taken by a woman and a boy together. A boy can finish the work alone in 20 days and 2 women together can finish it in 30 days. In how many days will the work be finished by 4 men?

SSC CGL 18/07/2023 (Shift-04)

(a) 2 (b) 2.14
(c) 2.5 (d) 3

236. 4 men's work is equal to 6 women's work, and 4 women's work is equal to 6 boys' work. A boy can finish the work in 60 days. In how many days can the work be finished by a man and a woman together?

SSC CGL 26/07/2023 (Shift-01)

(a) 16 (b) 24
(c) 20 (d) 12

237. 10 women take 16 days to complete a work which can be completed by 6 men in 8 days. 12 men started working and after 2 days 6 men left, and 5 women joined them. In how many days will the work be completed ?

SSC CGL 26/07/2023 (Shift-03)

(a) $\frac{3}{2}$ (b) $\frac{16}{5}$
(c) $\frac{5}{2}$ (d) $\frac{26}{5}$

238. 1 man and 4 women can complete a work in $\frac{65}{4}$ days, while 3 men and 4 women can complete it in $\frac{13}{2}$ days. In how many days will be 13 women complete the same.

SSC CGL 06/12/2022 (Shift-04)

(a) 20 (b) 16
(c) 14 (d) 18

239. 25 men and 45 women can complete a piece of work in 15 days, while 15 men and 60 women can complete it in 20 days. In how many days can 69 men and 67 women complete the work?

SSC CGL 07/12/2022 (Shift-01)

(a) 10 (b) 5
(c) 8 (d) 6

240. A project can be completed by 2 men and 5 women in 8 days while 4 men and 6 women can complete the same project in 5 days. How many men will be required to complete this project in 4 days?

SSC MTS 07/07/2022 (Shift-01)

(a) 8 (b) 10
(c) 9 (d) 12

241. 5 men and 2 boys can do in 30 days as much work as 7 men and 10 boys can do in 15 days. How many boys should join 40 men to do the same work in 4 days?

SSC CGL 12/04/2022 (Shift-03)

(a) 10 (b) 15
(c) 12 (d) 14

242. 4 men and 5 women can complete a work in 15 days, whereas 9 men and 6 women can complete it in 10 days. To complete the same work in 7 days, how many women should assist 4 men?

SSC CGL TIER- II 29/01/2022

(a) 14 (b) 15
(c) 11 (d) 13

243. Five men can complete a work in 20 days. Ten women can complete the same work in 15 days. Two men and six women started working together. After 5 days, three women left the work and a new man joined the work. The group continued working together till the end of the work. In how many days will they be able to do the remaining work?

SSC CGL 18/08/2021(Shift-03)

(a) 14 (b) 19
(c) $18\frac{1}{3}$ (d) $18\frac{1}{3}$

244. 4 men and 6 women can complete a work in 5 days, while 3 men and 4 women can complete it in 7 days. Similar how many men will have to help 25 women to complete $2\frac{1}{2}$ times the work in 5 days?

SSC CGL 04/03/2020 (Shift-03)

(a) 8 (b) 10
(c) 4 (d) 5

245. If 3 goats or 5 sheep can graze a field in 54 days, then in how many days can 6 goats and 8 sheep graze the same field?

SSC CPO 03/10/2023 (Shift-01)

(a) 12 days (b) 10 days
(c) 8 days (d) 15 days

246. If one man or two women or four boys or five girls can finish a work in 39 days, then how many days will one man, one woman, one boy and one girl together take to finish the same work?

SSC CGL 02/12/2022 (Shift-03)

(a) 40 (b) 10
(c) 30 (d) 20

247. If 8 men or 16 women or 32 boys can do a piece of work in 8 months, then in how many months can 4 men, 4 women and 4 boys together complete the work?

SSC Phase XII 20/06/2024 (Shift-02)

(a) $9\frac{1}{7}$ (b) $6\frac{3}{7}$
(c) $8\frac{2}{7}$ (d) $10\frac{5}{7}$

248. The one-day work of 2 men is equal to the one-day work of 4 women or the one-day work of 8 qualified workers. 10 qualified workers can finish a work in 8 days. If a man, a woman and a qualified worker work in the same order on three different days, the work is finished in ____ days.

SSC Phase XII 24/06/2024 (Shift-02)

(a) $\frac{203}{6}$ (b) $\frac{135}{4}$
(c) $\frac{131}{4}$ (d) $\frac{166}{5}$

◆ TYPE – VIII ◆
CONCEPT OF CONTRACTOR

249. A contractor decided to complete a work in 80 days and employed 60 men at the beginning and 20 men additionally after 20 days and got the work completed as per schedule. If he had not employed the additional men, how many extra days would he have needed to complete the work (round off to the nearest integer)?

SSC CGL 05/12/2022 (Shift-02)

(a) 32 days (b) 20 days
(c) 30 days (d) 26 days

250. A civil contractor planned to build an over bridge of 3 km distance in 600 days. For this purpose, he employed 90 workers. After 200 days of work, it was observed that only 0.5 km of the bridge was completed. What is the number of extra workers required to complete the work in time?

SSC CGL 07/12/2022 (Shift-03)

(a) 100 (b) 140
(c) 125 (d) 135

◆ TYPE – IX ◆
CONCEPT OF AP IN TIME & WORK

251. 60 men can complete a work in 40 days. They start work together but after every 10 day, 5 men leave the work. In how many days will the work be completed?

SSC CPO 10/11/2022 (Shift-02)

(a) 47.5
(b) 49.5
(c) 42.5
(d) 45.5

252. Each one of five men independently can complete a work in 20 days. The work is started by one person. Next day one more person joins and every next day one more person joins. From the fifth day, five persons continued working as a team. In how many days, will the work be completed?

SSC CGL 17/08/2021(Shift-03)

(a) 2 (b) 6
(c) 3 (d) 5

253. A group of men decided to complete a job in 4 days. However, since 10 men dropped out every day, the job got completed at the end of the 7th day. How many men were there in the beginning?

SSC Phase XII 24/06/2024 (Shift-04)

(a) 90 (b) 70
(c) 140 (d) 35

◆ TYPE – X ◆
MISCELLANEOUS QUESTIONS

254. A and B working together can complete the work in d days. Working alone, A takes (8 + d) and B takes (18 + d) days to complete the same work. A works for 4 days, In how many days will B alone complete the remaining work?

SSC CGL 04/03/2020 (Shift-02)

(a) 24 (b) 16
(c) 18 (d) 20

255. When A alone does a piece of work, he takes 25 days more than the time taken by A and B to do the work together. On the other hand, B alone takes 16 days more than the time taken by A and B to do the work together. How many days will A and B, working together, take to do the work?

SSC CPO 04/10/2023 (Shift-01)

(a) 22 days (b) 20 days
(c) 24 days (d) 23 days

256. Ten men begin to do a work. But after some days, four of them left the job. As a result, the job that could have been completed in 40 days is completed in 50 days. How many days after the commencement of the work did the four men leave?

SSC CGL 08/12/2022 (Shift-01)

(a) 30 (b) 20
(c) 35 (d) 25

257. A work was finished by L, P and Q together. L and P together finished 50 percent part of the work and P and Q together finished 60 percent part of the work. Who among the three is most efficient?

SSC MTS 13/06/2023 (Shift-01)

(a) All are equally efficient
(b) L
(c) Q
(d) P

258. Four persons, P Q, R, S were engaged for doing a task, with the condition that P; Q; R; S work, respectively, on (Mondays, Thursdays); (Tuesdays, Fridays); (Wednesdays, Saturdays): (Sundays). The task was began on a Monday, and got completed on the 15th day, which was also a Monday. If the efficiencies of P Q, R, S in respect of doing this task were in the proportion 1 : 2: 3: 4, then in how many days could R complete the task, working alone without break?

SSC MTS 12/10/2021 (Shift-02)

(a) 12 (b) 13
(c) 10 (d) 11

◆ TYPE – XI ◆
WORK & WAGES

259. A and B undertake a project worth ₹36,000. A alone can do the work in 25 days. They worked together for 5 days. For the next five days, B worked alone. After that, A substituted B and completed the remaining work in 5 days. The share of A in the earnings is:

SSC CPO 04/10/2023 (Shift-01)

(a) ₹21,600 (b) ₹14,400
(c) ₹14,600 (d) ₹21,400

260. Arin alone can do a piece of work in 6 days and Selvi alone can do the same in 8 days. Arin and Selvi undertook to do it for ₹ 7,200. With the help of Kevin, they completed the work in 3 days. How much is to be paid to Kevin?

SSC MTS 14/09/2023 (Shift- 03)

(a) ₹700 (b) ₹800
(c) ₹600 (d) ₹900

261. Fifteen persons working 12 hours a day earn ₹18,000 per week. How many rupees will 18 persons working 9 hours a day earn per week?

SSC CHSL 01/07/2024 (Shift-04)

(a) Rs.16,020 (b) Rs.12,600
(c) Rs.12,060 (d) Rs.16,200

262. P and Q can do a work in 12 days and 9 days, respectively. They both worked together and earned ₹63,000. The share of P (in) is:

SSC CHSL 10/07/2024 (Shift-02)

(a) 36,000 (b) 21,000
(c) 27,000 (d) 9,000

263. A, B and C can do a work in 10 days, 15 days, and 20 days, respectively. They finished that work together and got ₹2,600 as wages. Find C's wage.

SSC CGL 20/07/2023 (Shift-02)

(a) ₹550 (b) ₹600
(c) ₹575 (d) ₹625

264. 4 women and 7 men earn a total of ₹ 11,480 in 7 days, while 10 women and 17 men earn a total of ₹36,360 in 9 days. How much will 11 women and 9 men together earn (in ₹) in 13 days?

SSC CGL 24/07/2023 (Shift-03)

(a) ₹42770 (b) ₹42640
(c) ₹42510 (d) ₹42900

265. Ashok and Anil undertake to do a piece of work for ₹ 4,500. Ashok alone could do the work in the 8 days and Anil in 12 days. With the assistance of Amar, they finished the work in 4 days. What is the share of Amar?

SSC CGL 27/07/2023 (Shift-01)

(a) ₹1,500 (b) ₹750
(c) ₹2,250 (d) ₹2,500

266. Anita and Anand can complete a work in 12 days and 18 days respectively. They undertook to complete that work for ₹48,000. With the help of Arun, they completed the work in 6 days. Find the sum of the shares of Anita and Anand (in ₹).

SSC Phase XI 27/06/2023 (Shift-04)

(a) 40000 (b) 8000
(c) 16000 (d) 24000

267. X, Y and Z can do a piece of work in 4 days, 5 days and 7 days, respectively. They get ₹415 for completing the work. If X,Y and Z have worked together to complete the work, what is X's share?

SSC Phase XI 28/06/2023 (Shift-01)

(a) ₹ 275 (b) ₹ 175
(c) ₹ 200 (d) ₹ 225

268. Tina alone can do a piece of work in 12 days and Meena alone can do the same work in 15 days. If Tina and Meena undertook to do this work for ₹18,000, then how much amount will Meena get, if they work together?

SSC CHSL 09/03/2023 (Shift-01)

(a) ₹10,000 (b) ₹6,000
(c) ₹12,000 (d) ₹8,000

269. Mohit and Rohit undertook a work for ₹4400. Mohit alone can do that work in 10 days and Rohit alone can do the same work in 15 days. If they work together, then what will be the difference in the amount they receive?

SSC CHSL 09/03/2023 (Shift-04)

(a) ₹800 (b) ₹1050
(c) ₹900 (d) ₹880

270. Rani can do a work in 10 days, Priya can do the same work in 15 days and Guddu can do the same work in 12 days. If they do that work together and they are paid ₹9000, then what is the share of Priya?

SSC CHSL 17/03/2023 (Shift-01)

(a) ₹2400 (b) ₹3000
(c) ₹3500 (d) ₹3600

271. A alone can complete the project in 10 days; B alone can complete it in 20 days while C alone can complete it in 30 days. They together earn ₹ 1,100 for the project. By how much do the total earnings of A and C exceed the earnings of B ?

SSC CHSL 21/03/2023 (Shift-03)

(a) ₹600 (b) ₹900
(c) ₹700 (d) ₹500

272. A can complete a task in 12 days and B can complete the same task in 18 days. They start working together but A works for only 2 days. The remaining work is completed by B. If the total wage is ₹ 2,400, then what is B's share (in ₹)?

SSC CHSL 27/05/2022 (Shift- 3)

(a) 1600 (b) 1800
(c) 1200 (d) 2000

273. A, B and C can do a work in 8, 10 and 12 days, respectively. After completing the work together, they received ₹ 5,550. What is the share of B (in ₹) in the amount received?

SSC CGL 12/04/2022 (Shift-01)

(a) 1500 (b) 1850
(c) 1800 (d) 1696

274. A and B worked together and received a total of ₹ 18,000 for 15 days. A's efficiency in the work was 5 times that of B's. The daily wage of A (in ₹) was:

SSC CGL TIER- II 03/02/2022

(a) 800 (b) 600
(c) 1200 (d) 1000

275. A can do a piece of work in 8 days while B alone can do it in 12 days. They work together for 4 days and the remaining work is completed by C alone in 2 days. They are paid ₹ 7,200 for the completion of the entire work. The earnings of A, B and C, respectively, are:

SSC MTS 18/10/2021 (Shift-02)

(a) ₹ 2400, ₹ 2400 ₹ 2400
(b) ₹ 4000, ₹ 2400 ₹ 800
(c) ₹ 3600, ₹ 2400 ₹ 1200
(d) ₹ 3000, ₹ 3000 ₹ 1200

276. Samir and Puneet can complete the same work in 10 days and 15 days respectively. The work was assigned for ₹ 4500. After working together for 3 days Samir and Puneet involved Ashok. The work was completed in total 5 days. What amount (in ₹) was paid to Ashok?

SSC CGL 16/08/2021(Shift-03)

(a) 750
(b) 1500
(c) 1071
(d) 800

ANSWER KEY

1.	(d)	2.	(c)	3.	(c)	4.	(b)	5.	(b)	6.	(c)	7.	(b)	8.	(b)	9.	(a)	10.	(c)
11.	(c)	12.	(b)	13.	(b)	14.	(d)	15.	(b)	16.	(a)	17.	(a)	18.	(a)	19.	(a)	20.	(a)
21.	(d)	22.	(a)	23.	(b)	24.	(b)	25.	(d)	26.	(c)	27.	(b)	28.	(b)	29.	(c)	30.	(a)
31.	(c)	32.	(a)	33.	(c)	34.	(a)	35.	(b)	36.	(d)	37.	(c)	38.	(d)	39.	(b)	40.	(b)
41.	(a)	42.	(b)	43.	(c)	44.	(b)	45.	(c)	46.	(a)	47.	(b)	48.	(d)	49.	(c)	50.	(d)
51.	(c)	52.	(d)	53.	(c)	54.	(b)	55.	(d)	56.	(b)	57.	(a)	58.	(c)	59.	(d)	60.	(a)
61.	(c)	62.	(c)	63.	(d)	64.	(c)	65.	(d)	66.	(d)	67.	(c)	68.	(b)	69.	(a)	70.	(a)
71.	(b)	72.	(c)	73.	(c)	74.	(c)	75.	(d)	76.	(d)	77.	(c)	78.	(a)	79.	(b)	80.	(c)
81.	(c)	82.	(d)	83.	(c)	84.	(c)	85.	(c)	86.	(b)	87.	(a)	88.	(a)	89.	(d)	90.	(d)
91.	(a)	92.	(b)	93.	(d)	94.	(a)	95.	(c)	96.	(c)	97.	(a)	98.	(b)	99.	(a)	100.	(d)
101.	(b)	102.	(b)	103.	(a)	104.	(c)	105.	(d)	106.	(c)	107.	(b)	108.	(b)	109.	(d)	110.	(d)
111.	(b)	112.	(c)	113.	(a)	114.	(b)	115.	(b)	116.	(d)	117.	(b)	118.	(c)	119.	(d)	120.	(b)
121.	(d)	122.	(b)	123.	(a)	124.	(d)	125.	(d)	126.	(c)	127.	(a)	128.	(b)	129.	(d)	130.	(d)
131.	(a)	132.	(a)	133.	(c)	134.	(d)	135.	(a)	136.	(d)	137.	(c)	138.	(c)	139.	(d)	140.	(b)
141.	(c)	142.	(a)	143.	(c)	144.	(a)	145.	(a)	146.	(a)	147.	(a)	148.	(d)	149.	(b)	150.	(a)
151.	(b)	152.	(a)	153.	(d)	154.	(d)	155.	(b)	156.	(c)	157.	(d)	158.	(b)	159.	(b)	160.	(b)
161.	(c)	162.	(d)	163.	(b)	164.	(d)	165.	(a)	166.	(b)	167.	(c)	168.	(c)	169.	(c)	170.	(d)
171.	(c)	172.	(d)	173.	(b)	174.	(c)	175.	(d)	176.	(d)	177.	(b)	178.	(c)	179.	(d)	180.	(b)
181.	(c)	182.	(d)	183.	(a)	184.	(d)	185.	(b)	186.	(d)	187.	(c)	188.	(c)	189.	(c)	190.	(d)
191.	(c)	192.	(b)	193.	(a)	194.	(b)	195.	(b)	196.	(c)	197.	(c)	198.	(c)	199.	(c)	200.	(c)
201.	(c)	202.	(d)	203.	(c)	204.	(d)	205.	(b)	206.	(b)	207.	(c)	208.	(c)	209.	(a)	210.	(a)
211.	(a)	212.	(b)	213.	(b)	214.	(c)	215.	(b)	216.	(b)	217.	(c)	218.	(c)	219.	(a)	220.	(a)
221.	(d)	222.	(a)	223.	(b)	224.	(a)	225.	(a)	226.	(a)	227.	(c)	228.	(b)	229.	(d)	230.	(b)
231.	(b)	232.	(d)	233.	(d)	234.	(d)	235.	(b)	236.	(a)	237.	(d)	238.	(a)	239.	(d)	240.	(a)
241.	(a)	242.	(d)	243.	(a)	244.	(d)	245.	(d)	246.	(d)	247.	(a)	248.	(b)	249.	(b)	250.	(d)
251.	(a)	252.	(b)	253.	(b)	254.	(a)	255.	(b)	256.	(d)	257.	(c)	258.	(d)	259.	(b)	260.	(d)
261.	(d)	262.	(c)	263.	(b)	264.	(b)	265.	(b)	266.	(a)	267.	(b)	268.	(d)	269.	(d)	270.	(a)
271.	(d)	272.	(d)	273.	(c)	274.	(d)	275.	(c)	276.	(a)								

SOLUTIONS

1. (d) LCM of (20, 28) = 140

Eff. ↓ Total work ↓

J → 20 days 7

140

R → 28 days 5

Time required = $\frac{140}{12} = 11\frac{2}{3}$ days

Alternate Method:

$t_{(J+R)} = \frac{20 \times 28}{20+28} = \frac{35}{3} = 11\frac{2}{3}$ days

2. (c)

Eff.

A → 4 days 3

12 (T.W)

B → 6 days 2

No. of days = $\frac{12}{5} = 2\frac{2}{5}$ days

Alternate Method:

$t_{(A+B)} = \frac{4 \times 6}{4+6} = \frac{24}{10} = \frac{12}{5} = 2\frac{2}{5}$ days

3. (c) L.C.M. of 20 and 15 = 60

Eff. ↓ T.W ↓

Shobhita → 20 hours 3

60

Saroj → 15 hours 4

Efficiency of Shobhita and Saroj = 7

Time taken by both to finish the work = $\frac{60}{7} = 8\frac{4}{7}$ hours.

Alternate Method:

$t_{(S+S)} = \frac{20 \times 15}{20+15} = \frac{300}{35}$

$= \frac{60}{7} = 8\frac{4}{7}$ hours.

4. (b)

Eff. ↓ Total work ↓

Akhil → 24 days 1

24

Shyam → 12 days 2

Eff. → A + S → 3

Time taken by A + S to complete the work = $\frac{24}{3} = 8$ days.

Alternate Method:

$t_{(A+S)} = \frac{24 \times 12}{24+12} = \frac{24}{3} = 8$ days

5. (b)

Eff. ↓ T.W ↓

A → 4 days 3

12

B → 12 days 1

Eff. of A + B → 4

Time taken by A + B = $\frac{12}{4} = 3$ days

6. (c)

Eff. ↓ T.W ↓

A → 9 days 5

45

B → 15 days 3

Eff. of A + B → 8

Time taken by A + B = $\frac{45}{8} = 5\frac{5}{8}$ days

7. (b) L.C.M of 12, 24 = 24

Eff. ↓ T.W ↓

P → 12 days 2

24

Q → 24 days 1

Eff. of P + Q → 3

Time taken by P + Q = $\frac{24}{3} = 8$ days

8. (b)

Eff. ↓ T.W ↓

A → 10 days 4

40

B → 40 days 1

Eff.of A + B = 5

Time taken by A + B = $\frac{40}{5} = 8$ days

9. (a)

Eff. ↓ Total work ↓

P → $\frac{1}{5}$ →12 →60 days 4

240

Q → $\frac{1}{6}$ → 8 →48 days 5

Time taken by (P + Q) to complete the work = $\frac{240}{9} = \frac{80}{3} = 26\frac{2}{3}$ days

10. (c)

Eff. ↓ Total work ↓

A = $\frac{1}{3}$ → 7days →21days 5

105

B = $\frac{2}{7}$ →10 days →35 days 3

Time taken by (A + B) = $\frac{105}{8} = 13\frac{1}{8}$ days

11. (c)

Eff. ↓ Total work ↓

A → $\frac{1}{4}$ → 9 days → 36 days 7

252

B → $\frac{2}{3}$ $\xrightarrow{\times 14}$ 28 days → 42days 6

Time taken by A + B = $\frac{252}{13}$ days

12. (b)

Eff. ↓ Total work ↓

Disha→12 hrs 5

60

Mohit→10 hrs 6

Time taken by (Disha + Mohit) to complete double work

$= \frac{120}{11} = 10\frac{10}{11}$ hrs.

13. (b)

Eff. ↓ Total work ↓

Janson → 23.4 days = $\frac{117}{5}$ 5

117

Rafique → 39 days = 39 3

Time taken by them to complete work together = $\frac{117}{5+3} = 14.625$ days

14. (d)

Eff. ↓ T.W ↓

A → 20% = $\frac{1}{5}$ $\xrightarrow{\times 7}$ 7 days $\xrightarrow{\times 7}$ 35 days 4

140

B → 25% = $\frac{1}{4}$ $\xrightarrow{\times 7}$ 7 days $\xrightarrow{\times 7}$ 28 days 5

Work done in 7 days working together = 7 × 9 = 63

Percentage of work = $\frac{63}{140} \times 100 = 45\%$

15. (b)

Eff. ↓ Total work ↓

A = $\frac{3}{8}$ → 36 days → 96 days 9

864

B = $\frac{1}{2}$ → 27 days → 54 days 16

I. Ratio of efficiency of A and B = 9 : 16

It is clear that A is less efficiency than B.

II. time taken by A and B to do $\frac{11}{15}$

part of work = $\frac{\left(864 \times \frac{11}{15}\right)}{16+9}$

= 25.344 days.

Statement II is not correct

Hence, Only statement I is correct.

16. (a) A + B → 25 Days

B → 30 × $\frac{3}{2}$ = 45 days

Eff. ↓ Total work ↓

A + B → 25 days 9

225

B → 45 days 5

Time taken by A to do $\frac{4}{15}$ work alone

$= \frac{225 \times \frac{4}{15}}{9-5} = \frac{225 \times 4}{15 \times 4} = 15$ Days

17. (a) LCM of (20, 12) = 60

Eff. ↓ Total work ↓

J → 20 days 3

60

J + R → 12 days 5

↓ ↓

Eff.→3 2

Time taken by Rahul to paint the room = $\frac{60}{2} = 30$ days

Alternate method:-

Time taken by Rahul = $\frac{12 \times 20}{20-12}$

$= \frac{240}{8} = 30$ days

18. (a) LCM of (120, 72) = 360

Eff. ↓ Total work ↓

A →120 days 3

360

A + B →72 days 5

↓ ↓

Eff.→3 2

∴ Time taken by B = $\frac{360}{2}$ =180 days

Alternate Method:

Time taken by B = $\frac{120 \times 72}{120-72}$

$= \frac{120 \times 72}{48}$ =180 days

19. (a)

Eff. ↓ T.W ↓
V+R → 40h — 5
200
V → 50h — 4

Efficiency of Raju = 5 – 4 = 1

∴ Time taken by Raju = $\frac{200}{1}$

= 200 hours.

20. (a)

Eff. ↓ T.W ↓
A + B → 15 days — 6
90
A → 18 days — 5

Eff. → A B
↓ ↓
5 1

Time taken by B to complete the work = $\frac{90}{1}$ = 90 days.

21. (d)

Eff. ↓ T.W ↓
Rohan → 10h — 2
20
Rohan + Mohan → 4h — 5

Efficiency of Mohan = 5 – 2 = 3 units

Time taken by Mohan = $\frac{20}{3}$ hr.

22. (a)

Eff. ↓ T.W ↓
Sapna → 12h — 2
24
Sapna + Riya → 8h — 3

Efficiency of Riya = 3 – 2 = 1

Time taken by Riya = $\frac{24}{1}$ = 24 hrs.

23. (b)

Eff. ↓ T.W ↓
Julie + Antony → 15 days — 4
60
Julie → 20 days — 3

Efficiency of Antony = 4 – 3 = 1

Time taken by Antony to complete the work = $\frac{60}{1}$ = 60 days

24. (b)

Eff. T.W
A + B → 8 days — 2
16
B → 16 days — 1

Efficiency of A = 2 – 1 = 1

Time taken by A to do the work

= $\frac{16}{1}$ = 16 days

25. (d) L.C.M of 25 & 20 = 100

Eff. ↓ T.W ↓
Sumit → 25 hour — 4
100
Sumit + Rajiv → 20 hour — 5
↓ ↓
Eff. → 4 1

Time taken by Rajiv = $\frac{100}{1}$ = 100 hrs.

26. (c)

Eff. ↓ Total work ↓
J → 42 days — 9
378
R + J → 27 days — 14
↓ ↓
Eff. → 5 9

Time taken by rishi

= $\frac{378}{5}$ = 75 $\frac{3}{5}$ days

27. (b)

Eff. ↓ Total Work ↓
A → 10 days — 1
10
A + B → $\frac{5}{2}$ days — 4
↓ ↓
Eff. → 1 3

Time taken by B =

$\frac{\text{Total work}}{\text{eff.}} = \frac{10}{3}$ days

28. (b) 35% → 6 days

100% → $\frac{120}{7}$ days

Eff. ↓ Total work ↓
George → $\frac{120}{7}$ days — 7
120
George + Jim → 12 days — 10
↓ ↓
Eff. → 7 3

Time taken by Jim to complete the task = $\frac{120}{3}$ = 40 days

29. (c)

T.W ↓
A → 12 days — 4
48
B → 16 days — 3

Work done by A + B in 6 days

= 6 × (4 + 3) = 42

Remaining work = 48 – 42 = 6

Required fraction = $\frac{6}{48} = \frac{1}{8}$

30. (a)

Eff. ↓ Total work ↓
A → $\frac{1 \to 8}{10 \to 80h}$ — 1
80 unit
B → $\frac{1 \to 4}{5 \to 20h}$ — 4

∴ Required time = $\frac{9}{16} \times \frac{80}{5}$ = 9 hrs

31. (c)

Eff. T.W
Riya → 6 days — 4
24
Sangeeta → 8 days — 3

Eff. → R + S = 7 unit

ATQ,

Work done by Riya in 3 days

= 4 × 3 = 12 units.

Remaining work = 24 – 12 = 12 unit

Time taken by Sangeeta and Riya to do remaining work = $\frac{12}{7} = 1\frac{5}{7}$ days.

∴ Total time take to complete work

= 3 + 1$\frac{5}{7}$ = 4$\frac{5}{7}$ days

32. (a)

Eff. ↓ Total work ↓
A → 6 days — 2
12
B → 4 days — 3

Work done by A in 2 days

= 2 × 2 = 4 units

Remaining work = 12 – 4 = 8 units

Time taken by them to complete the remaining work = $\frac{8}{5} = 1\frac{3}{5}$ days

Total time taken to complete the work = 2 + 1$\frac{3}{5}$ = 3$\frac{3}{5}$ days

33. (c)

Eff. ↓ Total work ↓
A → 25 days — 3
75
B → 15 days — 5

Work done by B in 10 days

= 10 × 5 = 50 units

Remaining work = 75 – 50 = 25 units

Time taken by A to complete the remaining work = $\frac{25}{3} = 8\frac{1}{3}$ days

34. (a) Number of pages typed by Raju in one hour = $\frac{32}{4}$ = 8 pages

Number of pages typed by Akbar is one hour = $\frac{48}{6}$ = 8 pages

In one hour, number of pages they type together = 8 + 8 = 16 pages

∴ Time = $\frac{256}{16}$ = 16 hours

35. (b)

Eff. ↓ Total work ↓
Suresh → 10 h — 1
10
Shalu → 10 h — 1

If they working together to complete this work in 10 day,

Each day time (h) taken by both of them = $\frac{10}{10\,\text{day} \times 2} = \frac{1}{2}$ = 0.5h

Alternate method:-

Suresh × 10 × 1 = Shalu × 5 × 2

$\frac{\text{Suresh}}{\text{Shalu}} = \frac{1}{1}$ [Eff.]

Total work = 1 × 10 × 1 = 10 unit

Time (h) = $\frac{10\,\text{unit}}{10\,\text{day} \times 2} = \frac{1}{2}$ h = 0.5 hrs.

36. (d)

Eff. ↓ Total work ↓
Ram → 5 × 4 = 20 hrs. — 3
60
Seema → 3 × 10 = 30 hrs. — 2

Time taken by them = $\frac{60}{(3+2)\times 6}$

= $\frac{60}{30}$ = 2 hour

37. (c)

×2
$\frac{17}{27}$ Part → 34 days
54 days
×2

∴ Entire order of printing will be done in 54 days.

38. (d) Arun can complete this work

$$\begin{tikzcd} \Rightarrow \frac{2}{3}\text{unit} \arrow[r, bend left, "\times 6"] \arrow[r, bend right, "\times 6"'] & \frac{12 \text{ days}}{18 \text{ days}} \end{tikzcd}$$

Arun can complete $\frac{1}{6}$ of this work in

$= \frac{1}{6} \times 18 = 3$ days

39. (b)

$$\begin{tikzcd} \frac{7}{11}\text{unit} \arrow[r, bend left, "\times 2"] \arrow[r, bend right, "\times 2"'] & \frac{14 \text{ days}}{22 \text{ days}} \end{tikzcd}$$

Required time = 22 – 14 = 8 days

40. (b) LCM of (14, 28, 42) = 84

Eff. ↓ Total work ↓
X → 14 days 6
Y → 28 days 3 → 84 unit
Z → 42 days 2

Time taken by them to complete the work = $\frac{84}{6+3+2} = \frac{84}{11} = 7\frac{7}{11}$ days

Alternate Method:

$t_{(X+Y+Z)} = \frac{14 \times 28 \times 42}{(14 \times 28)+(28 \times 42)+(42 \times 14)}$

$= \frac{14 \times 28 \times 42}{14 \times 154} = \frac{84}{11} = 7\frac{7}{11}$ days

41. (a) L.C.M of 12, 15 and 20 = 60

Eff. ↓ T.W ↓
A → 12 days 5
B → 15 days 4 → 60
C → 20 days 3
Eff.of A+B+C = 12

Time taken by A+B+C = $\frac{60}{12} = 5$ days

Alternate Method:

$t_{(A+B+C)} = \frac{12 \times 15 \times 20}{(12 \times 15)+(15 \times 20)+(20 \times 12)}$

$= \frac{3600}{720} = 5$ days

42. (b) L.C.M of 24, 5 & 12 = 120 unit

Eff. ↓ T.W ↓
X → 24 days 5
Y → 5 days 24 → 120
Z → 12 days 10
Eff. of X+Y+Z = 39 unit

Time taken by them when working together = $\frac{120}{39} = 3\frac{1}{13}$ days

Alternate Method:

$t_{(X+Y+Z)} = \frac{24 \times 5 \times 12}{(24 \times 5)+(12 \times 5)+(12 \times 24)}$

$= \frac{120 \times 12}{468} = \frac{120}{39} = 3\frac{1}{13}$ days

43. (c) ATQ,

Eff. ↓ Total work ↓
Vipin → 2 days 3
Vaibhav → 3 days 2 → 6
Chirag → 6 days 1

∴ Required time = $\frac{6}{(3+2+1)} = \frac{6}{6}$

= 1 day

44. (b)

Eff. ↓ Total work ↓
1st → 9 min 2
2nd → 18 min 1 → 18 unit
3rd → 6 min 3

Required time = $\frac{18}{2+1+3} = \frac{18}{6} = 3$ min.

45. (c)

Eff. Total Work
X → 3 days 8
Y → $\frac{8}{3}$ days 9 → (24)
Z → $\frac{12}{5}$ days 10

∵ They work 6 hours in a day.

Time taken by (X + Y + Z) = $\frac{24 \times 6}{27}$

= 5 hour 20 min

46. (a)

Eff. ↓ Total work ↓
Avtar → 24 days 5
Ali → 20 days 6 → 120
Ali + Avtar + Ashok → 8 days 15
Eff.→ 6 5 4

∴ Time taken by Ashok

$= \frac{120}{4} = 30$ days

47. (b)

Eff. ↓ Total work ↓
Reena→12 days 3
Ram →18 days 2 → 36
Ram + Reena + Shyam → 6 days 6
Eff. → 2 3 1

Time taken by Shyam alone to complete the work = $\frac{36}{1} = 36$ days

48. (d) LCM of 20, 10 and 5 = 20

Eff. ↓ T.W ↓
A → 20 days 1
B → 10 days 2 → 20
A + B + C → 5 days 4
Eff. → 1 2 1

Time taken by C alone to complete the work = $\frac{20}{1} = 20$ days.

49. (c)

Eff. ↓ Total work ↓
R →20 h 3
A → 12 h 5 → 60
R + A + S → 5 h 12
Eff.→ 3 5 4

Time taken by Satish = $\frac{60}{4} = 15$ hrs.

50. (d)

Eff. ↓ Total work ↓
A → 27 days 2
B →54 days 1 → 54 unit
A + B + C →9 days 6
Eff.→ 2 1 3

Now, $\frac{8^{th}}{9}$ of work = $\frac{8}{9} \times 54 = 48$ units

∴ Time taken by C = $\frac{48}{3} = 16$ days

51. (c)

Eff. ↓ Total work ↓
A → 10 days 1
B → 5 days 2 → 10

$$\begin{array}{lcc} & \overbrace{A+B} & \overbrace{A+C} \\ \text{Time} \rightarrow & 2 \text{ days} & 3 \text{ days} \\ \text{Eff.} \rightarrow & \downarrow \times 3 & \downarrow \times(1+n) \\ \text{Total work} \rightarrow & 6 \quad + & 3+3n = 10 \end{array}$$

⇒ 6+3+3n = 10

⇒ n = $\frac{1}{3}$

Time taken by C to complete 60% work

$= 10 \times \frac{6}{10} \times 3 = 18$ days

52. (d)

Eff. ↓ Total work ↓
A → 10 days 1
B → 5 days 2 → 10

$$\begin{array}{lcc} & \overbrace{A+B} & \overbrace{A+C} \\ \text{Time} \rightarrow & 2 \text{ days} & 3 \text{ days} \\ \text{Eff.} \rightarrow & \downarrow \times 3 & \downarrow \times(1+n) \\ \text{Total work} \rightarrow & 6 \quad + & (3+3n) = 10 \end{array}$$

⇒ 6 + 3 + 3n = 10

⇒ n = $\frac{1}{3}$

Time taken by C to complete 40% work

$= 10 \times \frac{40}{100} \times 3 = 12$ days

53. (c)

Eff. ↓ Total Work ↓
A = 20% = $\frac{1}{5}$ → 4 days / 5 → 20 days 3
B = 33$\frac{1}{3}$% = $\frac{1}{3}$ → 10 days / 3 → 30 days 2 → 60

ATQ, Let C's efficiency = n

$$\begin{array}{lcc} & \overbrace{A+B} & \overbrace{C} \\ \text{Time} \rightarrow & 9 \text{ days} & 6 \text{ days} \\ \text{Eff.} \rightarrow & \downarrow \times 5 & \downarrow \times n \\ \text{Total work} \rightarrow & 45 \quad + & 6n = 60 \end{array}$$

⇒ 45 + 6n = 60 ⇒ n = $\frac{5}{2}$

Time taken by (B + C) to complete

75% work = $\frac{\left(60 \times \frac{75}{100}\right)}{\left(2+\frac{5}{2}\right)} = \frac{45}{9} \times 2$

= 10 days

54. (b)

Eff. ↓ Total Work ↓

A = $\frac{1}{3}$ → 30 days / → 90 days — 2

180

B = $\frac{2}{5}$ → 24 days / → 60 days — 3

ATQ,

Time → $\overset{A+B}{20\text{ days}}$ $\overset{C}{8\text{ days}}$

Eff. → ↓×5 ↓×n

Total work → 100 + 8n = 180

⇒ 100 + 8n = 180 ⇒ n = 10

Time taken by (A + B + C)

$= \frac{180}{(2+3+10)} = 12$ days

55. (d)

Eff. ↓ Total work ↓

A → $\frac{2}{5}$ →12 days / →30 days — 5

150

B → $\frac{3}{5}$ →15 days / →25 days — 6

Time → $\overset{A+B}{10\text{ days}}$ $\overset{C}{4\text{ days}}$

Eff. → ↓×11 ↓×n

Total work → 110 + 4n = 150

⇒110 + 4n = 150

⇒ n = 10

Time taken to complete 28% of the work $= \frac{\frac{28}{100}\times150}{5+6+10} = 2$ days

56. (b)

Eff.

Meera → 20 days — 6

Neena → 30 days — 4 — 120

Seema → 40 days — 3

ATQ,

(Meera + Seema) × 4 day + (Neena + Seema) x days = 120

⇒ (6 + 3) × 4 + (4 + 3) × x = 120

= 36 + 7x = 120

⇒ $x = \frac{84}{7} = 12$ days

Hence, total work completed all together = 12 + 4 = 16 days

57. (a)

Eff. ↓ Total work ↓

Ram → 15 days — 10

Rohan → 25 days — 6 — 150

Rohit → 30 days — 5

2 Days work of Rohan and Rohit

= (6 + 5) × 2 = 22 unit

Remaining work = 150 – 22

= 128 unit

Time taken by Ram and Rohan to do remaining work

$= \frac{128}{10+6} = 8$ days

Thus, total time taken

= 2 + 8 = 10 days

58. (c)

Eff. ↓ T.W ↓

Mitu → 12 hr. — 1

Titu + Situ → 2 hr. — 6 — 12

Mitu + Situ → 3 hr. — 4

Efficiency of Situ = (4 – 1) = 3

Efficiency of Titu = (6 – 3) = 3

Time taken by Titu $= \frac{12}{3} = 4$ hours

59. (d)

eff.

Manish → 21 — 20

Nakul → 28 — 15 — 420(T.W.)

Pintu → 15 — 28

If Nakul joined them from first day then extra work = 15 × 5 = 75 unit

Total work = 420 + 75 = 495 unit

Days required

$= \frac{495}{(20+15+28)} = \frac{495}{63} = \frac{55}{7}$ days

Time for which Nakul worked

$= \frac{55}{7} - 5 = \frac{20}{7} = 2\frac{6}{7}$ days

60. (a) L.C.M. of 9, 12, 18 = 36

Eff. ↓ T.W ↓

A → 9 days — 4

B → 12 days — 3 — 36

C → 18 days — 2

Efficiency of A + B + C = 9 unit

$\overset{A}{3\text{ days}}$ + $\overset{B}{3\text{ days}}$ + $\overset{C}{x\text{ days}}$

↓×4 ↓×3 ↓×2

12 + 9 + 2x = 36

⇒ 2x = 15

∴ $x = 7.5 = 7\frac{1}{2}$ days

61. (c) LCM (10, 15, 12) = 60

Eff. ↓ Total work ↓

A → 10 days — 6

B → 15 days — 4 — 60

C → 12 days — 5

1st - 5 days → A → 6 × 5 = 30 unit

2nd - 5 days → B → 5 × 4 = 20 unit

10 days 50 unit

Remaining work = 60 – 50 = 10 units

Time taken by C to do remaining work $= \frac{10}{5} = 2$ days

62. (c)

Eff. ↓ Total work ↓

A → 15 days — 10

150

B → 25 days — 6

A.T.Q

Let, efficiency of C = n

Time → $\overset{A+B}{5\text{ days}}$ $\overset{A+C}{4\text{ days}}$

Eff. → ↓×16 ↓×(10+n)

Total work → 80 + (40+4n) = 150

⇒ 80 + 40 + 4n = 150

⇒ $n = \frac{30}{4}$

Time taken by C $= \frac{150}{30} \times 4 = 20$ days

63. (d)

Eff. ↓Total work ↓

A = 20% = $\frac{1}{5}$ → 4 days / → 20 days — 3

60

B = $33\frac{1}{3}$% = $\frac{1}{3}$ → 10 / → 30 days — 2

9 days work = (A + B)×9 = 9 × 5 = 45

Remaining work = 60 – 45 = 15

C's Efficiency $= \frac{15}{6} = 2.5$ unit

75% of work completed by (B + C)

$= 60 \times \frac{75}{100} \times \frac{1}{4.5} = 10$ days

64. (c)

Eff. ↓ Total work ↓

X → 46 days — 2

Y → 92 days — 1 — 92 unit

Z → 23 days — 4

ATQ,

$\overset{X}{2\text{ days}}$ $\overset{X+Y}{6\text{ days}}$ $\overset{X+Y+Z}{d\text{ days}}$

↓×2 ↓×3 ↓×7

4 + 18 + 7d = 92

7d = 92 – 22

⇒ d $= \frac{70}{7} = 10$ days

∴ X worked for = 2 + 6 + 10 = 18 days

65. (d)

Eff. ↓ Total work ↓

X → 46 days — 2

Y → 92 days — 1 — 92 units

Z → 23 days — 4

A.T.Q.

$\overset{X}{7\text{ days}}$ $\overset{X+Y}{1\text{ days}}$ $\overset{X+Y+Z}{x\text{ days}}$

↓×2 ↓×3 ↓×7

14 + 3 + 7x = 92

$x = \frac{75}{7}$ days.

∴ Y worked for $= 1 + \frac{75}{7} = \frac{82}{7}$

$= 11\frac{5}{7}$ days.

66. (d)

Eff. ↓ Total work ↓

X → 16 days — 3

48

Y → 24 days — 2

A.T.Q,

Time → $\overset{X+Y}{4\text{ days}}$ $\overset{Z}{21/2\text{ days}}$

Eff. → ↓×5 ↓×n

Total work → 20 + $\frac{21}{2}$n = 48

⇒ 20 + $\frac{21}{2}$n = 48 ⇒ n = $\frac{8}{3}$

Time taken by Y and Z to complete the work $= \frac{48}{\left(2+\frac{8}{3}\right)} \times \frac{7}{8} = \frac{48\times7}{14\times8} \times 3$

= 9 days

67. (c)

Eff. ↓ Total work ↓

A → 18 days — 5

90

B → 30 days — 3

A.T.Q

Time → $\overset{A+B}{5\text{ days}}$ $\overset{C}{15\text{ days}}$

Eff. → ↓×8 ↓×n

Total work → 40 + 15n = 90

⇒ 40 + 15n = 90

⇒ $n = \frac{10}{3}$

A and C together can complete $\frac{5}{6}$th

$= 90 \times \frac{5}{6} = 75$ unit

Time taken by A and C together to do 75 unit work

$= \frac{75}{\left(5+\frac{10}{3}\right)} = \frac{75}{25} \times 3 = 9$ days

68. (b)

Eff. Total work
A → 20 days — 5
B → 25 days — 4
Total work → 100

ATQ,

$\underbrace{A+B}$ $\underbrace{C}$
Time → 10 days 10 days
Eff. → ↓×9 ↓×n
Total work → 90 + 10n = 100
⇒ 90 + 10n = 100
⇒ n = 1
∴ Time taken by (A + B + C)

$= \frac{100}{5+4+1} = 10$ days

69. (a)

A → 60% $= \frac{3}{5}$ $\xrightarrow{\times 6}$ 18 days, $\xrightarrow{\times 6}$ 30 days — Eff. 5
B → 40% $= \frac{2}{5}$ $\xrightarrow{\times 5}$ 10 days, $\xrightarrow{\times 5}$ 25 days — 6
T.W → 150

ATQ,
Let, C's eff. = n

$\underbrace{A+B}$ $\underbrace{C}$
Time → 10 days 4 days
Eff. → ↓×11 ↓×n
Total work → 110 + 4n = 150
⇒ 110 + 4n = 150
⇒ n = 10
Time taken by C to complete the work

$= \frac{150}{10} = 15$ days

70. (a)

(A + B) → 15 — Eff. 6
(B + C) → 30 — 3
(C + A) → 45 — 2
T.W → 90

2(A + B + C) = 11

Eff. → A + B + C = $\frac{11}{2}$

Time taken by all together to finish the work

$= \frac{90 \times 2}{11} = \frac{180}{11} = 16\frac{4}{11}$ days.

71. (b)

A + B → 18 days — Eff. 4
B + C → 24 days — 3
A + C → 36 days — 2
Total work → 72

2(A + B + C) → 9 days

Time taken by (A + B + C) = $\frac{72}{9/2}$

= 8 × 2 days = 16 days

72. (c) L.C.M. of 4, 5 and 10 = 20

A + B → 4 days — Eff. 5
B + C → 5 days — 4
C + A → 10 days — 2
Total work → 20

2(A + B + C) = 11

Eff. → (A + B + C) = $\frac{11}{2}$

∴ Time taken by (A + B + C) to Complete whole work

$= \frac{20}{\frac{11}{2}} = \frac{40}{11} = 3\frac{7}{11}$ days.

Alternate Method:

$t_{(A+B+C)} = \frac{2 \times 4 \times 5 \times 10}{(4 \times 5)+(5 \times 10)+(10 \times 4)}$

$= \frac{400}{110} = 3\frac{7}{11}$ days

73. (c)

A + B → 10 days — Eff. 6
B + C → 12 days — 5
C + A → 6 days — 10
Total work → 60

2(A + B + C) = 21

Eff. → (A + B + C) = $\frac{21}{2}$

Efficiency of A = $\frac{21}{2} - \frac{5}{1} = \frac{11}{2}$

Time taken by A alone to finish the work = $\frac{60}{11} \times 2 = \frac{120}{11}$ days

74. (c)

Time — Eff.
A + B → 25 days — 36
B + C → 36 days — 25
C + A → 30 days — 30
A + B + C + D → 18 days — 50
Total Work → 900

2(A + B + C) = 36 + 25 + 30 = 91

A + B + C = $\frac{91}{2}$ = 45.5

Eff. of D = 50 – 45.5 = 4.5

Required time = $\frac{900}{4.5}$ = 200 days

75. (d)

Reena + Riya → 36 days — Eff. 9
Geeta + Riya → 54 days — 6
Reena + Geeta → 81 days — 4
T.W → 324

2(Reena + Riya + Geeta) = 19

(Reena + Riya + Geeta) = 9.5

Efficiency of Reena = 9.5 – 6 = 3.5

Time taken by Reena alone to complete the work = $\frac{324}{3.5}$

$= \frac{648}{7} = 92\frac{4}{7}$ days

76. (d)

(A + B) → 12 — Eff. 5
(B + C) → 15 — 4
(C + A) → 10 — 6
T.W → 60

2(A + B + C) = 15

(A + B + C) = 7.5

Efficiency of A = 7.5 – 4 = 3.5

Time taken by A alone to complete the work = $\frac{60}{3.5} = 17\frac{1}{7}$ days

77. (c)

R+S → 10 days — Eff. 12
S+T → 12 days — 10
T+R → 8 days — 15
T.W → 120

2(R+S+R) = 37

Eff. of R + S + T = $\frac{37}{2}$

Time taken by all together to finish the work = $\frac{120}{\frac{37}{2}} = \frac{240}{37}$ days.

78. (a)

X + Y → 18 days — Eff. 4
Y + Z → 24 days — 3
X + Y + Z → 12 days — 6
T.W → 72
Eff. → 3 1 2

Time taken by X + Z to complete the work = $\frac{72}{5} = 14\frac{2}{5}$ days.

79. (b)

Time — Eff.
R + S → 2 days — 2
S + M → 4 days — 1
R + M → 2 days — 2
TW → 4

R + S + M = $\frac{5}{2}$

⇒ R + 1 = $\frac{5}{2}$ ⇒ R = $\frac{3}{2}$

Required time = 4 × $\frac{2}{3} = \frac{8}{3}$ days.

80. (c) LCM of 10, 12, 15 = 60

Efficiency
A + B → 10 days — 6
B + C → 12 days — 5
C + A → 15 days — 4
Total work → 60

2(A + B + C) = 15

Efficiency of A + B + C = $\frac{15}{2}$

∴ Time taken by A + B + C to do the work = $\frac{60}{\frac{15}{2}}$ = 8 days

81. (c) LCM of (9, 8, 18) = 72
Time ↓ Eff. ↓ Total Work ↓
A + B = 9 days — 8
B + C = 18 days — 4 ⟩ 72
A + B + C = 8 days — 9
Eff. of C = 9 – 8 = 1
Eff. of A = 9 – 4 = 5
Time taken by (A + C) to complete the work = $\frac{72}{6}$ = 12 days

82. (d)
Eff. ↓ Total Work ↓
A + B → $\frac{25}{2}$ days — 6
B + C → $\frac{75}{4}$ days — 4 ⟩ 75
C + A → 15 days — 5
2(A + B + C) → 15 unit
Eff. → (A + B + C) → 7.5 unit
Eff. of C = 7.5 – 6 = 1.5
D = 40% of 1.5 = 0.6
Time taken by (A + B + C + D) to complete the work = $\frac{75}{8.1}$ days
= $9\frac{7}{27}$ days

83. (c)
Eff. ↓ Total work ↓
A + B → $\frac{80}{3}$ days — 9
B + C → 48 days — 5 ⟩ 240
A + C → 30 days — 8
2(A + B + C) = 22
A + B + C = 11 units
Time taken by A alone to complete 60% of the work = $\frac{3}{5}\times240\times\frac{1}{6}$
= 24 days

84. (c)
Eff. ↓ Total work ↓
A + B → 36 days — 5
B + C → 60 days — 3 ⟩ 180
C + A → 45 days — 4
∵ 2(A + B + C) = 12
A + B + C = 6
∴ Efficiency of A = 3
Time taken by A alone to complete the work = $\frac{180}{3}$ = 60 days

85. (c) LCM of 20, 24 = 120
Eff. ↓ Total work ↓
X + Y → 20 days — 6 ⟩ 120
Y + Z → 24 days — 5
$\underbrace{X+Y}$ $\underbrace{Y+Z}$ $\underbrace{Z}$ Total
Days → 10 days 8 days 5 days
↓×6 ↓×5 ↓×n ↓
Work → 60 + 40 + 5n = 120
⇒ 5n = 20 ⇒ n = 4
X : Y : Z
eff. → 5 : 1 : 4
Now, 75% of total work = 120 × $\frac{3}{4}$ = 90
Time taken by X + Z to do this work
= $\frac{90}{9}$ = 10 days

86. (b)
Rani → 12 days — 4 unit ⟩ 48 unit (T.W.)
Adya → 16 days — 3 unit
on alternate days started by Rani
in 2 days 7 unit
(×6)×6
12 days 42 unit
+1 +4 unit
$\frac{2}{3}$ days 2 unit
$13\frac{2}{3}$ days 48 unit
Hence, Total work complete will be $13\frac{2}{3}$ days

87. (a)
Time Eff.
A → 13 days — 2 ⟩ T.W 26
B → 26 days — 1
They are working on alternate days.
Days Men Work
1st → A → 2 unit
2nd → B → 1 unit
2 days$_{\times 8}$ ⟶ $3_{\times 8}$
16 days ⟶ 24 unit
1day → A → 2 unit
17 days ⟶ 26 unit

88. (a) Total work = L.C.M of (40, 60) = 120
Eff. ↓ Total work ↓
Akash → 40 days — 3 ⟩ 120
Vikash → 60 days — 2
ATQ,
Days Man Total work
Ist Akash 3
IInd Vikash 2
2 days$_{\times 24}$ → 5 unit$_{\times 24}$
48 days → 120 unit
Time taken to complete work when works on alternate day basis = 48 days

89. (d) L.C.M of 48 and 64 = 192
Eff. ↓ T.W ↓
Rajan → 64 days — 3 ⟩ 192
Rajat → 48 days — 4
Days Man Work
1st → Rjt → 4
2nd → Rjn → 3
2 days$_{\times 27}$ → $7_{\times 27}$ unit
54 days → 189 unit
$\frac{3}{4}$ days → Rjt → 3 unit
$54\frac{3}{4}$ days → 192 unit

90. (d) L.C.M. of 10 and 8 days = 40
Total work = 40 unit
Eff. ↓ T.W ↓
A → 10 days — 4 ⟩ 40
B → 8 days — 5
ATQ,
Days Man Total work
Ist A 4
IInd B 5
2 days$_{\times 4}$ → 9 unit$_{\times 4}$
8 days → 36 unit
1 days $\xrightarrow{A}$ 4 unit
9 days → 40 unit
Time taken by A and B to complete the work when working alternatively = 9 days

91. (a)
Eff. ↓ T.W ↓
X → 18 days — 3 ⟩ 54
Y → 27 days — 2
They working on alternate days
Days Men Work
1st → X → 3
2nd → Y → 2
2 days$_{\times 10}$ ⟶ $5_{\times 10}$
20 days ⟶ 50 unit
1 day → X → 3
$\frac{1}{2}$ day → Y → 1
$21\frac{1}{2}$ days ⟶ 54 unit

92. (b)
Eff. ↓ T.W ↓
Sarthak → 20 days — 5 ⟩ 100
Mohan → 25 days — 4
Days Men Work
1st ⟶ S ⟶ +5
2nd ⟶ M ⟶ +4
2 days$_{\times 11}$ ⟶ $9_{\times 11}$
22 days ⟶ 99 unit
$\frac{1}{5}$ days ⟶ S ⟶ 1 unit
$22\frac{1}{5}$ days ⟶ 100 unit

93. (d)
Eff. ↓ T.W ↓
A → 15 days — 6 ⟩ 90
B → 18 days — 5
Days Work
1st → A → +6
2nd → B → +5
2 days$_{\times 8}$ ⟶ $11_{\times 8}$
16 days ⟶ 88 unit
$\frac{1}{3}$ day → A → 2 unit
$16\frac{1}{3}$ days ⟶ 90 unit

94. (a)
Eff. ↓ Total work ↓
A → 16 days — 3 ⟩ 48
R → 24 days — 2
Working on alternate days

Days Man Work
1st → A → 3
2nd → R → 2
2 days$_{\times 9}$ → 5$_{\times 9}$ unit
18 days → 45 unit
1 days → A → 3 unit
19 days → 48 unit

Hence, the work will complete in 19 days

95. (c) L.C.M. of 12, 18 = 36

Eff. ↓ Total work ↓
P → 12 days 3 36
Q → 18 days 2

Days Man Work
1st → P → 3
2nd → Q → 2
2 days$_{\times 7}$ → 5$_{\times 7}$
14 days → 35 unit
$\frac{1}{3}$ days → P → 1 unit
$14\frac{1}{3}$ days → 36 unit

Hence, they will complete the work in $14\frac{1}{3}$ days

96. (c)

Eff. ↓ Total work ↓
A → 15 days 4 60
P → 12 days 5

Work start with Amar.

Days Man Work
1st → A → 4
2nd → P → 5
2 days$_{\times 6}$ → 9$_{\times 6}$ unit
12 days → 54 unit
1 day → A → 4 unit
$\frac{2}{5}$ day → P → 2 unit
$13\frac{2}{5}$ days → 60 unit

Hence, they will complete the work in $13\frac{2}{5}$ days

97. (a)

Eff. ↓ Total work ↓
A → 25 days 6 150
B → 30 days 5

Days Man Work
1st → A → 6
2nd → B → 5
2 days$_{\times 2}$ → 11$_{\times 2}$ unit
4 days → 22 unit
1 days → A → 6 unit
5 days → 28 unit

Remaining work = 150 – 28 = 122 unit

Time taken by B = $\frac{122}{5} = 24\frac{2}{5}$ days

98. (b)

Eff. ↓ Total work ↓
A → 8 days 2 16
A + B → $\frac{16}{3}$ days 3
↓ ↓
Eff.→ 2 1

B, A, B, A .....

Now,

Days Man Work
1st → B → 1
2nd → A → 2
2 days$_{\times 5}$ → 3$_{\times 5}$ unit
10 days → 15 unit
1 days → B → 1 unit
11 days → 16 unit

Hence, they will complete the work in 11 days

99. (a)

Eff. ↓ Total work ↓
A → 6 hours 8 48 units
V → 16 hours 3

Working pattern → (A, V, A, V....)

Hours Man Work
1st → A → 8
2nd → V → 3
2 hrs.$_{\times 4}$ → 11$_{\times 4}$ unit
8 hrs. → 44 unit
$\frac{1}{2}$ hr → A → 4 unit
$8\frac{1}{2}$ hrs. → 48 unit

Hence, the work will complete in $8\frac{1}{2}$ hours = 8 hours 30 min

100. (d)

Eff. ↓ Total work ↓
A → 6 hrs. 5 30
B → 10 hrs. 3

Working fashion → (A, B, A, B,....)

Hours Man Work
1st → A → 5
2nd → B → 3
2 hrs.$_{\times 3}$ → 8$_{\times 3}$ unit
6 hrs. → 24 unit
1 hr → A → 5 unit
$\frac{1}{3}$ hr → B → 1 unit
$7\frac{1}{3}$ hrs. → 30 unit

Hence, the work will complete in $7\frac{1}{3}$ hours.

101. (b)

Eff. ↓ Total work ↓
A → 4 hours 3 12
B → 12 hours 1

Hours Men Work
1st → Avi → 3
2nd → Ravi → 1
2hours$_{\times 3}$ → 4 unit$_{\times 3}$
6 hours → 12 unit

Time = 5 am + 6 hrs. = 11 am

102. (b)

Eff. ↓ Total work ↓
M → 16 days 3 48
W → 12 days 4

A.T.Q

Days Men Work
1st → M → 3
2nd → W → 4
2days$_{\times 6}$ → 7 unit$_{\times 6}$
12 days → 42 unit
1 days → 3 unit
$\frac{3}{4}$ days → 3 unit
$13\frac{3}{4}$ days → 48 unit

Total time taken by them

$= 13\frac{3}{4} = \frac{55}{4}$ days

103. (a) LCM of 10, 15 and 20 = 60

Eff. ↓ Total work ↓
A → 10 days 6
B → 15 days 4 60
C → 20 days 3

Days Man Work
1st → A → 6
2nd → B → 4
3rd → C → 3
3 days$_{\times 4}$ → 13$_{\times 4}$ unit
12 days → 52 unit
1 days → A → 6 unit
$\frac{1}{2}$ days → B → 2 unit
$13\frac{1}{2}$ days → 60 unit

Hence the work will complete in $13\frac{1}{2}$ days

104. (c) LCM of 5, 6, 8 = 120

Eff. ↓ Total work ↓
Mohit → 5 days 24
Nitu → 6 days 20 120
Soma → 8 days 15

Days Man Work
1st → M → 24
2nd → N → 20
3rd → S → 15
3 days$_{\times 2}$ → 59$_{\times 2}$unit
6 days → 118 unit
$\frac{1}{12}$ days → M → 2 unit
$6\frac{1}{12}$ days → 120 unit

Hence, they will complete the work in $6\frac{1}{12}$ days

105. (d)

	Eff.	Total work
A → 20 days	15	300
B → 25 days	12	
C → 30 days	10	

Days	Man	Work
1st →	A →	15
2nd →	B →	12
3rd →	C →	10

3 days$_{\times8}$ → 37$_{\times8}$ unit

24 days → 296 unit

$\frac{4}{15}$ days → A → 4 unit

$24\frac{4}{15}$ days → 300 unit

Hence, the work will complete $24\frac{4}{15}$ days

106. (c) L.C.M. of 10, 12, 15 and 18 = 180

	Eff.	Total work
Megha → 12 days	15	180
Punam → 15 days	12	
Richa → 18 days	10	
Tushar → 10 days	18	

Days	Man	Work
1st →	M →	15
2nd →	P →	12
3rd →	R →	10
4th →	T →	18

4 days$_{\times3}$ → 55$_{\times3}$ unit

12 days → 165 unit

1 days → M → 15 unit

13 days → 180 unit

Hence, they will complete the work in 13 days

107. (b)

	Eff.	Total work
A → 24 days	10	240
B → 80 days	3	

A.T.Q

Day	Men	Work
1st →	B →	3
2nd →	B →	3
3rd →	A →	10

3 days$_{\times15}$ → 16 unit$_{\times15}$

45 days → 240 unit

In 45 days, the work will be done.

108. (b)

Time	Eff.	Total Work
A → 200 days	1	200 unit
B → 100 days	2	

They are working on alternate days.

Days	Men	Work
1st →	(A+B) →	3 unit
2nd →	A →	1 unit
3rd →	B →	2 unit

3 days$_{\times33}$ ⟶ 6$_{\times33}$

99 days ⟶ 198 unit

$\frac{2}{3}$ day → (A+B) → 2 unit

$99\frac{2}{3}$ days ⟶ 200 unit

109. (d)

	Eff.	Total work
A → 20 days	3	60
B → 30 days	2	
C → 60 days	1	

Days	Man	Work
1st →	A →	3
2nd →	A →	3
3rd ↪	A + B + C →	6

3 days$_{\times5}$ → 12$_{\times5}$

15 days → 60 unit

Hence, the work have been completed in 15 days.

110. (d)

	Eff.	Total work
A → 11 days	20	220
B → 20 days	11	
C → 55 days	4	

ATQ,

(A + B, A + C) ....

Days	Man	Work
1st →	A + B →	31
2nd →	A + C →	24

2 days$_{\times4}$ → 55$_{\times4}$ unit

8 days → 220 unit

Hence, the work will completed in 8 days.

111. (b)

	Eff.	Total work
X → 5 days	6	30
Y → 15 days	2	
Z → 30 days	1	

Days	Man	Work
1st →	X →	6
2nd →	X + Y + Z →	9

2 days$_{\times2}$ → 15$_{\times2}$ unit

4 days → 30 unit

Hence, the work will complete in 4 days

112. (c)

	Eff.	Total work
P → 5 days	6	30 unit
Q → 10 days	3	
R → 15 days	2	

A.T.Q

Days	Man	Work
1st →	(P+Q)	→ 9
2nd →	(P+R)	→ 8

2 days → 17 unit

1 days → 9 unit

$\frac{1}{2}$ days → 4 unit

$3\frac{1}{2}$ days → 30 unit

Hence, work will complete in $\frac{7}{2}$ days

113. (a)

	Eff.	Total work
A → 10 days	4	40
B → 20 days	2	
C → 40 days	1	

(A,A, A + B + C) → Working method

Days	Man	Work
1st →	A →	4
2nd →	A →	4
3rd →	A+B+C →	7

3 days$_{\times2}$ → 15$_{\times2}$ unit

6 days → 30 unit

1 day → A → 4 unit

1 day → A → 4 unit

$\frac{2}{7}$ day → A+B+C → 2 unit

$8\frac{2}{7}$ days → 40 unit

Hence, work will complete in $8\frac{2}{7}$ days.

114. (b)

	Eff.	Total work
R → 30 days	4	120 units
K → 40 days	3	
T → 60 days	2	

Days	Man	Work
1st →	R →	4
2nd →	R →	4
3rd →	R+K+T →	9

3 days$_{\times7}$ → 17$_{\times7}$ unit

21 days → 119 unit

$\frac{1}{4}$ day → R → 1 unit

$21\frac{1}{4}$ days → 120 unit

Hence, the work completes in $\frac{85}{4}$ days

115. (b)

	Eff.	Total work
A → 11 days	20	220 units
B → 20 days	11	
C → 55 days	4	

Working pattern → (A + B , C + B)

Days	Man	Work
1st →	B + A →	31
2nd →	B + C →	15

2 days$_{\times4}$ → 46$_{\times4}$ unit

8 days → 184 unit

1 day → B + A → 31 unit

$\frac{1}{3}$ day → B + C → 5 unit

$9\frac{1}{3}$ days → 220 unit

Hence, the work will complete in $9\frac{1}{3}$ days.

116. (d)

	Eff.	Total work
A → 11 days	6	66 unit
B → 22 days	3	
C → 33 days	2	

Days → Man → Work
1st → A + B → 9
2nd → B + C → 5
3rd → C + A → 8

$3\ \text{days}_{\times 3}$ → $22_{\times 3}$ unit
9 days → 66 unit

117. (b)

Eff. ↓ Total work ↓
A → 24 days — 5
B → 30 days — 4
→ 120

Morning shift : Evening shift
6(hrs) 4(hrs)

First day → A ↓ 6 hours ; B ↓ 4 hours

Second day → B ↓ 6 hours ; A ↓ 4 hours

Time		Work
2 days	→	9 unit
2 × 13 days	→	9 × 13 unit
26 days	→	117 unit

Remaining work = 3 unit

It is clear that work will complete on 27th day

118. (c)

Eff. ↓ Total work ↓
R → 20 days — 3
S → 15 days — 4
T → 10 days — 6
→ 60

Work done by-
Days → Man → Work
1st → R + T → 9
2nd → R + S → 7

$2\ \text{days}_{\times 3}$ → $16_{\times 3}$ unit
6 days → 48 unit
1 day → R + T → 9 unit
$\frac{3}{7}$ day → R + S → 3 unit

$7\frac{3}{7}$ days → 60 unit

Thus, Total required days

$= 7 + \frac{3}{7} = \frac{52}{7}$ days

119. (d)

Eff. ↓ Total work ↓
A → 36 days — 1
B → 36 days — 1
→ 36

ATQ,

Time		**Work**
5th day	→	10 unit
6th day	→	11 unit
7th day	→	13 unit
8th day	→	14 unit
10th day	→	18 unit
11th day	→	19 unit
14th day	→	25 unit
15th day	→	26 unit
16th day	→	27 unit
20th day	→	35 unit
21th day	→	36 unit

Hence, work will be completed on 21 July 2021

Alternate Method:

Eff. ↓ Total work ↓
A → 36 days — 1
B → 36 days — 1
→ 36

Ist	(a + b)
IInd	(a + b)
IIIrd	(a + b)
IVth	(a + b)
Vth	(a + b)
VIth	(b)
VIIth	(a + b)
VIIIth	(a)

∵ Done by work in 8 days = 7(a + b) = 14 unit

∴ 16 days → 28 unit
17th day → 2 unit
18th day → 1 unit (a absent)
19th day → 2 unit
20th day → 2 unit
21th day → 1 unit
21 days 36 unit

∴ Hence, work will be completed on 21 July 2021

120. (b) Let the total work = 30 unit

Days Work
A + B → 4 × 2 = 8 unit
B → 1 = 1 unit
A → 1 = 1 unit

6 days → 10 unit
×3 ×3
18 days 30 unit

So, the work completed on 18 August 2022

121. (d) A.T.Q,

Total work = 12 × 20 = 240 hours
I day → A → 8 hours
II day → B → 6 hours

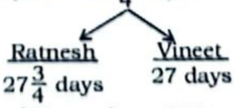
2 day ⟶ 14 hours
×17 ×17
34 days 238 hours

34 days + 2 hrs. → (238 + 2) hrs.
= 240 hrs.

So, $x = 34$, $y = 2$

122. (b)

Total work complete = $54\frac{3}{4}$ days



Let efficiency of Ratnesh and Vineet be R & S respectively.

$48R = R \times \frac{111}{4} + 27V$

⇒ 81R = 108V ⇒ R : V = 4 : 3 (efficiency)

Total work = 48 × 4 = 192 units

Time taken by Vineet alone to do the work = $\frac{192}{3} = 64$

123. (a) In 15 days man works for 8 days and women, 7 days again

In 14.5 days woman works for 7.5 days and man, 7 days

ATQ,

(8M + 7W) = (7.5W + 7M)

⇒ M = 0.5W

$\Rightarrow \frac{M}{W} = \frac{1}{2}$ (Eff.)

Now,

(8M + 7W) = 1 × M × D

⇒ (8 + 14) = 1 × D

⇒ D = 22 days

124. (d) ATQ,

A × 32 = 4A + 4B ⇒ 28A = 4B

$\therefore \frac{A}{B} = \frac{1}{7}$ (Eff.)

Total work = 32 × 1 = 32

Time taken by Bharat to complete 7 times of work = $\frac{32 \times 7}{7} = 32$ days

125. (d) A and B complete whole work in = $11\frac{1}{3}$ days

A and B work on alternate days, with B beginning so, B will work only 6 days

A will work = $11\frac{1}{3} - 6 = 5\frac{1}{3}$ days

A alone can finish work in = 24 days

A's one day work = $\frac{1}{24}$

A's $5\frac{1}{3}$ days work = $\frac{1}{24} \times \frac{16}{3} = \frac{2}{9}$

Remaining work = $\left(1 - \frac{2}{9}\right) = \frac{7}{9}$

B complete $\frac{7}{9}$ work in 6 days

B complete whole work in

$= \frac{6 \times 9}{7} = \frac{54}{7}$ days

B alone can complete $\frac{7}{9}$ th part of the work in = $\frac{54}{7} \times \frac{7}{9} = 6$ days

Alternate Method:

Since B start the work

B → 6 days ⇒ A → $5\frac{1}{3}$ days

ATQ,

$A \times 18\frac{2}{3} = B \times 6 \Rightarrow A \times \frac{56}{3} = B \times 6$

$\Rightarrow \frac{A}{B} = \frac{18}{56} = \frac{9}{28}$ (eff.)

T.W. = 24 × 9.

Time taken by B to do $\frac{7}{9}$ part of work = $\frac{24 \times 9 \times \frac{7}{9}}{28} = 6$ days

126. (c)

Eff. ↓ T.W ↓
Aman → 15 days — 4
Rajan → 20 days — −3
→ 60

Days Men Work
1st → A → +4
2nd → R → −3

$2\ \text{days}_{\times 56}$ ⟶ $1_{\times 56}$
112 days ⟶ 56 unit
1 day → A → 4 unit

113 days ⟶ 60 unit

127. (a) L.C.M. of 36 and 48 = 144

Eff. ↓ Total work ↓

A → 36 days 4

144

B → 48 days 3

B's 12 days work = 12 × 3 = 36 units

Remaining work = 144 – 36 = 108 units

Time taken by A to complete remaining work = $\frac{108}{4}$ = 27 days

128. (b) L.C.M of (10, 15) = 30

Eff. ↓ Total work ↓

A → 10 days 3

30

B → 15 days 2

A.T.Q

$\underbrace{A+B}$ $\underbrace{B}$

Time → 2 days n days

Eff. → ↓×5 ↓×2

Total work → 10 + 2n = 30

⇒ 10 + 2n = 30

⇒ n = 10

B will take 10 days to finish the remaining work

Alternate Method:

Required time = $\frac{10\times15-(10+15)\times2}{10}$

= 10 days.

129. (d)

Eff. ↓ Total work ↓

P + Q → 30 days 4

Q + R → 24 days 5 120

R + P → 20 days 6

2(P + Q + R) → 15

Eff. → (P + Q + R) → $\frac{15}{2}$

Eff. of P = $\frac{15}{2}$ – 5 = 2.5

ATQ,

$\underbrace{P+Q+R}$ + $\underbrace{P}$

Time → 10 days n days

Eff. → ↓×7.5 ↓×2.5

Work → 75 + 2.5n = 120

⇒ 75 + 2.5n = 120 ⇒ 2.5n = 45

∴ n = 18 days

130. (d)

Eff. T.W.

Rohan → 12 days 4

48

Hari → 16 days 3

ATQ,

Work done by Rohan + Hari in 3 days = 3(4 + 3) = 21 unit.

Remaining work = 48 – 21 = 27 unit

No. of days required to complete the work by Hari = $\frac{27}{3}$ = 9 days.

Total days required to complete total work = 9 + 3 = 12 days.

131. (a)

Eff. ↓ T.W ↓

P → 30 days 4

120

Q → 40 days 3

Work done by P and Q in 4 days

= (4 + 3) × 4 = 28 units

Remaining work = 120–28 = 92 units

Time taken by P to do remaining work = $\frac{92}{4}$ = 23 days

132. (a)

Eff. ↓ T.W ↓

A → 15 days 2

30

B → 30 days 1

Work done in 3 days = 3 × 3 = 9 unit

Remaining work = 30 – 9 = 21 unit

∴ Time taken by B = $\frac{21}{1}$ = 21 days

133. (c) (Raja + Rocky) × 5 = Total work

ATQ,

(Raja + Rocky) × 2 + Raja × 4

= (Raja + Rocky) × 5

⇒ 6 Raja + 2 Rocky = 5 Rocky + 5 Raja

⇒ $\frac{\text{Raja}}{\text{Rocky}} = \frac{3}{1}$ (Eff.)

Total work = (3 + 1) × 5 = 20

Time taken by Rocky to complete the work = $\frac{20}{1}$ = 20 days

Alternate Method:-

(Raja + Rockey) × 3 = Raja × 4

⇒ $\frac{\text{Raja}}{\text{Rockey}} = \frac{3}{1}$

∴ Total work = (3 + 1) × 5 = 20 units

Time taken by Rockey to complete the work = $\frac{20}{1}$ = 20 days.

134. (d)

Eff. ↓ Total work ↓

A → 36 days 5

180

B → 45 days 4

Work done by A and B in 2 days

= 2 × 9 = 18 unit

Remaining Work = 180 – 18 = 162 unit

Time taken by B to do remaining

= $\frac{162}{4}$ = 40.5 days

135. (a) $\frac{X\times20}{\frac{1}{2}} = \frac{Y\times10}{\frac{1}{5}}$

⇒ X × 40 = Y × 50 ⇒ $\frac{X}{Y} = \frac{5}{4}$

A.T.Q

$\underbrace{X}$ $\underbrace{Y}$

Time → 8 days n days

Eff. → ↓×5 ↓×4

Total work 40 + 4n = 200

⇒ 40 + 4n = 200

⇒ n = 40 days

Total time = 8 + 40 = 48 days

136. (d)

Eff. ↓ Total work ↓

B → 10 days 3

30 unit

C → 30 days 1

ATQ,

x(B + C) + 10C = 30

⇒ 4x = 30 – 10 = 20

⇒ x = 5

He left after 5 days from beginning.

137. (c)

Eff. ↓ Total work ↓

A → 25 days 4

100

B → 20 days 5

Total work done by A and B in 4 days.

= (4 + 5) × 4 = 36 unit

Remaining work = (100 – 36) = 64

Time taken by A = $\frac{64}{4}$ = 16 days

Total time = (16 + 4) = 20 days

138. (c)

Eff. ↓ Total work ↓

A → 24 days 5

B → 15 days 8 120

C → 12 days 10

ATQ,

$\underbrace{B+C}$ $\underbrace{A}$

Time → 3 days n days

Eff. → ↓×18 ↓×5

Total work → 54 + 5n = 120

⇒ 54 + 5n = 120

⇒ n = $\frac{66}{5} = 13\frac{1}{5}$ days.

Time taken by A to do 66 units of work = $13\frac{1}{5}$ days

139. (d)

Eff. ↓ Total work ↓

S → 6 days 4

24

V → 24 days 1

If Shivam did not leave the work then extra work = 4 × 3 = 12 unit

Time taken by Shivam and Vivek to do the work = $\frac{24+12}{4+1} = \frac{36}{5} = 7\frac{1}{5}$ days

Alternate Method:

Required time = $\frac{6\times24+24\times3}{6+24}$

= $\frac{36}{5} = 7\frac{1}{5}$ days

140. (b)

Eff. ↓ Total work ↓

A → 18 days 5

90

B → 30 days 3

Work done by B in $16\frac{2}{3}$ days

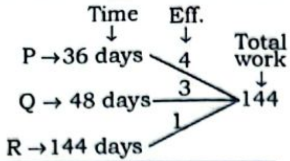
= $\frac{50}{3}\times3$ = 50 unit

Remaining work = 90 – 50 = 40 unit

Time taken by them to do 40 unit of work = $\frac{40}{8}$ = 5 days

Thus, A did for 5 days.

141. (c)


Time
Eff.
Total work
P → 36 days
Q → 48 days
R → 144 days
4
3
1
144

P + Q + R → 8 unit

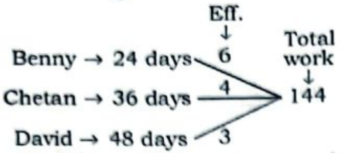
If P and Q did not leave jobs then extra work = (12 × 4) + (3 × 8) = 72 unit

Total work = (144 + 72) = 216 unit

Required time to complete this work by

$(P + Q + R) = \frac{216}{8} = 27$ days

142. (a)

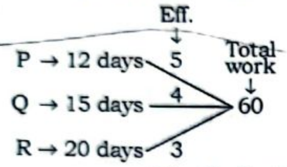

Eff.
Total work
Benny → 24 days
Chetan → 36 days
David → 48 days
6
4
3
144

Benny's 4 days extra work = 6 × 4 = 24 unit

Chetan's 10 days extra work = 4×10 = 40 unit

Required no. of days to complete the work $= \frac{144+24+40}{6+4+3} = \frac{208}{13} = 16$ days

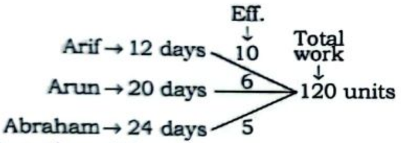
143. (c)


Eff.
Total work
P → 12 days
Q → 15 days
R → 20 days
5
4
3
60

∴ Time taken $= \frac{60+8\times5+3\times4}{12}$

$= \frac{112}{12} = \frac{28}{3}$ days

144. (a)


Eff.
Total work
Arif → 12 days
Arun → 20 days
Abraham → 24 days
10
6
5
120 units

Let, they did not leave and do some extra work

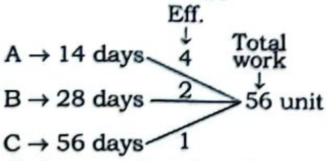
Extra work = 10 + 3 × 6 + 5 × 4 = 48 units

Total work done by Arif, Arun and Abraham

= 120 + 48 = 168 unit

∴ Required time $= \frac{168}{21} = 8$ days

145. (a)


Eff.
Total work
A → 14 days
B → 28 days
C → 56 days
4
2
1
56 unit

B's 2 days work = 4 unit

A's 3 days work = 12 unit

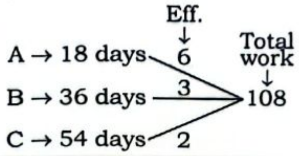
Total work to be completed

= 56 + 4 + 12 = 72 unit

∴ No. of days to complete the work

$= \frac{72}{7}$ days

146. (a)


Eff.
Total work
A → 18 days
B → 36 days
C → 54 days
6
3
2
108

Let, number of days to finish the work = x

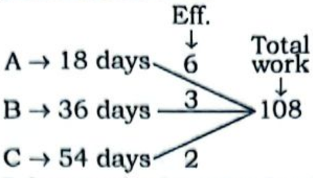
Number of days B works = $x - 5$

Number of days C works = $x - 10$

$6 \times x + 3(x-5) + 2(x-10) = 108$

$x = 13$ days

Alternate Method:


Eff.
Total work
A → 18 days
B → 36 days
C → 54 days
6
3
2
108

5 days work of B = 5 × 3 = 15 unit

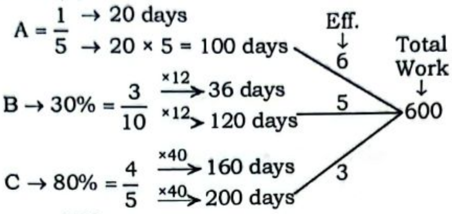
10 days work of C = 10 × 2 = 20 unit

Now, Total Work = 108 + 15 + 20 = 143

Time taken by $(A + B + C) = \frac{143}{11}$

= 13 days

147. (a)


A = 1/5 → 20 days
→ 20 × 5 = 100 days
B → 30% = 3/10
×12 → 36 days
×12 → 120 days
C → 80% = 4/5
×40 → 160 days
×40 → 200 days
Eff.
Total Work
6
5
3
600

ATQ,

$$\frac{8x}{9(x-41)} = \frac{19}{6}$$

$\Rightarrow 48x = 171x - 7011$

$\Rightarrow 123x = 7011$

$\Rightarrow x = 57$ days

$\Rightarrow 2x = 114$

∴ Work done by C in 114 days

= 3 × 114 = 342 units

Hence, fraction of work completed by $C = \frac{342}{600} = \frac{57}{100}$

148. (d) $\boxed{\text{Eff.} = \frac{\text{Work}}{\text{Time}}}$

R P

Time → 4 : 5

Work → 1 : 2

Eff. → 5 : 8

Let, total work = (24 × 13) units

∴ Time taken by Parul $= \frac{24\times13}{8}$

= 39 days

149. (b) Babita : Deepak

Efficiency → 5 : 4

Total work = 40 × 9 = 360 units

∴ Time taken by Deepak $= \frac{360}{4}$

= 90 days

150. (a) Rakesh Sapna

Eff.→ 1 : 2

Total Work = Efficiency × time

= (1 + 2) × 48 = 3 × 48 = 144 unit

Time taken by Sapna

$= \frac{144}{2} = 72$ days

151. (b) 6 × Teena = 4 × (Teena + Shyam)

⇒ Teena : Shyam = 2 : 1 (eff.)

Total work = 6 × 2 × 2 = 24 units

Time taken by Shyam alone to complete the work $= \frac{24}{1} = 24$ days.

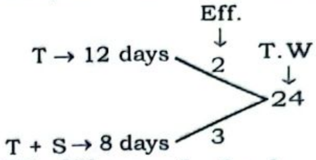
Alternate Method:

$\frac{1}{2}$ task Teena = 6 days

complete work by Teena = 12 days

$\frac{1}{2}$ task (Teena + Shyam) = 4 days

Complete work (T + S) = 8 days


Eff.
T.W
T → 12 days
T + S → 8 days
2
3
24

Eff. of Shyam = 3 – 2 = 1

Time taken by Shyam to complete the work alone $= \frac{24}{1} = 24$ days

152. (a) Joy : Tim

Efficiency→ 4 : 5

Time→ 5 : 4

$\downarrow \times 3$ $\downarrow \times 3$

15 days 12 days

153. (d) Nirmal : Amit

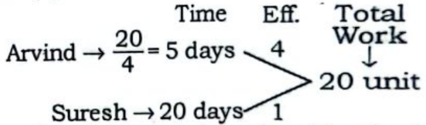
Efficiency→ 4 : 5

Time→ 5 : 4

$\downarrow \times 9$ $\downarrow \times 9$

45 days $\boxed{\text{36 days}}$

154. (d)


Time
Eff.
Total Work
Arvind → 20/4 = 5 days
Suresh → 20 days
4
1
20 unit

Total time taken by (Arvind + Suresh)

$= \frac{20}{5} = 4$ days

Alternate Method:

$\text{Eff.} \propto \frac{1}{T}$

$\text{Eff.} \rightarrow \overset{A}{4} \quad \overset{S}{1}$

Total work = days × eff. = 20 × 1

= 20 unit

Total time taken by (Arvind + Suresh)

$= \frac{20}{5} = 4$ days

155. (b) $\text{Efficiency} \propto \frac{1}{\text{time}}$

Tarun : Tripti

Efficiency → 2 : 1

Time → 1 : 2

Total work = (2 + 1) × 16 = 48 unit

Time taken by Tripti to complete the work $= \frac{48}{1} = 48$ days

156. (c) $\text{Time} = \frac{1}{\text{Eff.}}$

P Q
Eff. → 2 : 1
Time → 1 : 2
1 unit = 40 days
Total work = 40 × 2 = 80
Time taken by (P + Q) to complete the work = $\frac{80}{3}$ = 27 days

157. (d)
Eff. ↓ Total work ↓
X → 18 days 1
18
Y → 9 days 2
1 day work = 1 + 2 = 3 units
fraction = $\frac{3}{18} = \frac{1}{6}$

158. (b)
Eff. ↓ Total work ↓
Raj → 20 days 1
20
Pratap → 10 days 2
Time taken by (P + R) to do $\frac{3}{5}$ of total work = $\frac{3}{5} \times \frac{20}{3}$ = 4 days

159. (b) A + B → 48 days

	A		B
Efficiency	4	:	1

Let, total work = 5 × 48
Time taken by B = $\frac{5 \times 48}{1}$ = 240 days.

160. (b) ATQ,
R × 10 × 6 = S × 5 × 8
⇒ R : S = 2 : 3 (eff.)
Total work = 10 × 6 × 2 = 120 units
Time taken by them to do the work
= $\frac{120}{5 \times 6}$ = 4 days

161. (c) 6E × 5 = 5W × 7
⇒ E : W = 7 : 6 (eff.)
Total work = 6 × 7 × 5 = 210 units
Time taken by 7E and 4W to complete the work = $\frac{210}{7 \times 7 + 4 \times 6}$
= $\frac{210}{73} = 2\frac{64}{73}$ days

162. (d)

	P	:	Q
Days →	1	:	2
Eff. →	2	:	1

Total work = (2 + 1) × 36 = 108 units
Time taken by Q alone to finish the work = $\frac{108}{1}$ = 108 days.

163. (b) ATQ,
12 × man = 8 × woman
⇒ $\frac{\text{man}}{\text{woman}} = \frac{2}{3}$ (Eff.)
Total work = 12 × 2 = 24 unit
∴ Req. days = $\frac{24}{6 \times 2 + 4 \times 3} = \frac{24}{24}$
= 1 day

Alternate Method:
Eff. ↓ T.W ↓
1 Man → 12 days 2
24
1 Woman → 8 days 3
Time taken by 6 male and 4 female to complete the work = $\frac{24}{6 \times 2 + 4 \times 3}$
= 1 day

164. (d) ATQ, 4M = 6B
⇒ $\frac{M}{B} = \frac{3}{2}$ (Eff.)
Total work = 4M × 20 = 4 × 3 × 20
= 240 units
Then, time taken by 6M + 11B
= $\frac{240}{6M + 11B} = \frac{240}{40}$ = 6 days

165. (a) ATQ, 2m = 4w
⇒ $\frac{m}{w} = \frac{2}{1}$ (Eff.)
Total work = 2m × 34 days
= 2 × 2 × 34 = 136
Time taken by 6 men & 5 women to build this wall
= $\frac{136}{(6 \times 2 + 5 \times 1)} = \frac{136}{17}$ = 8 days

166. (b) ATQ,
A × 8 × 5 = B × 6 × 10
⇒ $\frac{A}{B} = \frac{3}{2}$ (Eff.)
Total work = 3 × 8 × 5 = 120 unit
∴ Time taken when working together
= $\frac{120}{5 \times 8}$ = 3 days

167. (c) ATQ,
A × 11 = B × 16
⇒ $\frac{A}{B} = \frac{16}{11}$ (Eff.)
Total Work = A × 15 = 15 × 16
= 240 unit
Time taken by A and B together to finish the work = $\frac{240}{27} = \frac{80}{9}$ days

168. (c)

Work	Time
10%	12 day
↓×10	↓×10
100%	120 day

$40\% = \frac{2}{5}$

	Priya		Rina
Eff. →	7	$\xleftarrow{+40\%}$	5

Total work = 5 × 120 = 600
↓×90%
540 unit
Time taken by Priya & Reena to complete the remaining work
= $\frac{540}{12}$ = 45 days

Alternate Method:

	R	:	P
Eff. →	5	:	7

ATQ,
$\frac{5 \times 12}{10\%} = \frac{12 \times n}{90\%}$
∴ n = 45 days

169. (c) Time taken by A = 25 days
Let, total work = 25 unit
Eff. (A) = 1
A worked for 5 days
work left = 20 unit
A and B worked for 8 days
Eff. (A + B) = $\frac{20}{8} = \frac{5}{2}$
Time taken by A and B to complete the work from beginning
= $\frac{25 \times 2}{5}$ = 10 days

Alternate Method:
Total work = A × 25 days
A.T.Q,
A × 20 = (A + B) × 8
⇒ A × 12 = B × 8 ⇒ $\frac{A}{B} = \frac{2}{3}$
∴ Total work = 2 × 25 = 50 units
Time taken by (A + B) = $\frac{50}{5}$ = 10 days

170. (d)

	Naman		Gagan
Work →	$\frac{1}{2}$		1
	1	:	2
Time →	4	:	5
Efficiency →	$\frac{1}{4}$		$\frac{2}{5}$
	5	:	8

Total work = 16 × 13
Time taken by Gagan =
$\frac{16 \times 13}{8}$ = 26 days

171. (c)
P = $\frac{1}{4}$ → 18 days
→ 72 days
Q = $\frac{5}{8}$ → 40 days
→ 64 days
Eff. ↓ Total work ↓
72 days 8
576
64 days 9
Time taken by P & Q to do $\frac{17}{48}$ part of work = 576 × $\frac{17}{48} \times \frac{1}{17}$ = 12 days

172. (d) Efficiency of A : B = 7 : 5 (given)
Total work = (7 + 5) × $\frac{35}{2}$ = 210 unit
Time taken by 'B' alone to complete 50% of the same work
= $\frac{210 \times 50}{100 \times 5} = \frac{105}{5}$ = 21 days

173. (b) Efficiency of Amita = Efficiency of (Bina + Sita)
Eff. ↓ Total work ↓
Sita → 35 5
175
Amita + Bina → 25 7
↓ ↓
Eff. → 6 1
Time required by Bina to complete work = $\frac{175}{1}$ = 175 days

174. (c) Time $\propto \frac{1}{\text{Eff.}}$

ATQ,

R T J

Time → 6 : 3 : 2

Eff. → 1 : 2 : 3

Total work → (3 + 2 + 1)×23

= 138 unit

∴ Time taken by Tom = $\frac{138}{2}$ = 69 hrs.

175. (d) A B C

Time → 6 3 2

Efficiency → 1 : 2 : 3

Total work = 8 × 6 = 48 units

Time taken by A → $\frac{48}{1}$ = 48 days

Time taken by B → $\frac{48}{2}$ = 24 days

Time taken by C → $\frac{48}{3}$ = 16 days

176. (d)

Eff. ↓ Total Work ↓

A + B → 18 days — 5

B + C → 30 days — 3

→ 90

By hit and trial,

Now, A : B : C

eff. → 4 : 1 : 2

Time taken by B = $\frac{90}{1}$ = 90 days

177. (b) A B C

Eff. → 2 : 5 : 3

Total work = 27 × (2 + 5 + 3) = 270 units

Time taken by B and C to complete

$\frac{4}{9}$ of the work = $\frac{270 \times \frac{4}{9}}{5+3}$ = 15 days

178. (c) A B C

Eff. → 2 : 3 : 5

Total work = 6 (2 + 3 + 5) = 60 units

20% of work = 60 × $\frac{20}{100}$ = 12 unit

∴ Time taken by A = $\frac{12}{2}$ = 6 days

179. (d)

Eff. ↓ Total work ↓

A + B → 27 days — 25

C → 75 days — 9

→ 675

Given that,

Time Eff.

$\frac{A}{B+C} = \frac{24}{10}$ $\frac{5 \xrightarrow{\times 2} 10}{12 \xrightarrow{\times 2} 24}$) 17 ×2 = 34

$\frac{A+B}{C} = \frac{27}{75}$ $\frac{25}{9}$) 34

A B C

Eff. → 10 : 15 : 9

∴ Time taken by B to complete the work = $\frac{675}{15}$ = 45 days

180. (b) A : C = 2 : 1 (efficiency)

LCM of 10, 15 = 30

Eff. ↓ Total work ↓

A + B → 10 days — 3

B + C → 15 days — 2

→ 30

By hit and trial, B's eff. = 1

Time taken by B to complete the work

= $\frac{30}{1}$ = 30 days

181. (c) We know,

Efficiency $\propto \frac{1}{\text{Time taken}}$

	A		B + C
Time taken →	3	:	2
Efficiency →	2	:	3

Again,

Eff. ↓ Total work ↓

C → 120 days — 1

A + B → 30 days — 4

→ 120

Eff. → 2 2 (A ↓, B ↓)

∴ Time taken by B alone

= $\frac{120}{2}$ = 60 days

182. (d)

Case- I: Time taken by X and (Y + Z)

= 3 : 1

Eff. = 1 : 3 = 5 : 15 (X + Y + Z = 20)

Case- 2: Time taken by Z & (Y + X)

= 4 : 1

Eff. = 1 : 4 = 4 : 16 (X + Y + Z = 20)

Total work = 20 × 10 = 200 units

Time taken by X and Z to complete the work = $\frac{200}{9} = 22\frac{2}{9}$ days

183. (a) 25% = $\frac{1}{4}$

A → $\frac{2 \rightarrow 12 \text{ days}}{5 \rightarrow 30 \text{ days}}$

$$\begin{array}{lcccc} & \underbrace{}_{A} & \underbrace{}_{B} & \underbrace{}_{C} & \underbrace{}_{D} \\ \text{Eff.} \rightarrow & 4 \xrightarrow{+25\%} & 5 & 4 \xrightarrow{-25\%} & 3 \\ \text{Time} \rightarrow & 5 & 4 & 3 & 4 \\ & \downarrow \times 6 & \downarrow \times 6 & \downarrow \times 4 & \downarrow \times 4 \\ \text{Days} \rightarrow & 30 & 24 \xrightarrow{-12} & 12 & 16 \end{array}$$

Eff. ↓ Total work ↓

A → 30 days — 8

B → 24 days — 10

C → 12 days — 20

D → 16 days — 15

→ 240

Efficiency of A + B + C + D = 8 + 10 + 20 + 15 = 53

∴ Time taken by them to do worked

= $\frac{240}{53}$ days.

184. (d) 40% = $\frac{2}{5}$

A B

Eff. → 7 : 5

Total work = 15 × 12 = 180 units

Work done by A in 15 days = 15 × 7 = 105 units

Remaining work done by B and C in 10 days ⇒ (B + C) × 10 = 75

⇒ (5 + C) = $\frac{15}{2}$

⇒ C = $\frac{5}{2}$ (efficiency)

Time taken by C to complete $\frac{1}{3}$rd of whole work = $\frac{180}{5} \times 2 \times \frac{1}{3}$

= 24 days

185. (b) Efficiency → A : B : C

4 : 5 : 2.5

Total work = $\left(\frac{23}{2} \times 4\right)$ = 46 unit

Time taken by A, B and C =

$\frac{46}{(4+5+2.5)} = \frac{46}{11.5} = \frac{460}{115}$ = 4 days

186. (d) A : B : C

4 : 5

5 : 7

Eff. → 4 : 5 : 7

Total work = 15 × 4 = 60

ATQ,

$$\begin{array}{lcccc} & \overbrace{}^{A+C} & & \overbrace{}^{A+B} & \\ \text{Time} \rightarrow & 3 \text{ days} & & n \text{ days} & \\ \text{Eff.} \rightarrow & \downarrow \times 11 & & \downarrow \times 9 & \\ \text{Total work} \rightarrow & 33 & + & 9n & = 60 \end{array}$$

⇒ 33 + 9n = 60

⇒ n = 3

A and B will complete remaining work in 3 days

187. (c) We know that,

Efficiency $\propto \frac{1}{\text{Time}}$

ATQ,

A : B : C

Eff.→ 4 : 5 : 6.4

Total work = 4 × 40 = 160 unit

$$\begin{array}{lcccc} & \overbrace{}^{A+B+C} & & \overbrace{}^{B} & \\ \text{Time} \rightarrow & 5 \text{ days} & & n \text{ days} & \\ \text{Eff.} \rightarrow & \downarrow \times 15.4 & & \downarrow \times 5 & \\ \text{Total work} \rightarrow & 77 & + & 5n & = 160 \end{array}$$

⇒ 77 + 5n = 160

⇒ n = $\frac{83}{5} = 16\frac{3}{5}$ days.

Time taken by B to complete the remaining work = $16\frac{3}{5}$ days

188. (c) 40% = $\frac{2}{5}$

Eff. → X : Y : Z

7 : 5 : 3

Total work = 15 × 21 = 315 unit

ATQ,

$$\begin{array}{lcccc} & \overbrace{}^{Y+Z} & & \overbrace{}^{X} & \\ \text{Time} \rightarrow & 35 \text{ days} & & n \text{ days} & \\ \text{Eff.} \rightarrow & \downarrow \times 8 & & \downarrow \times 7 & \\ \text{Total work} \rightarrow & 280 & + & 7n & = 315 \end{array}$$

⇒280 + 7n = 315

⇒ n = 5days.

Time taken by X = 5 days

189. (c) A : B
Eff. → 2 : 1
Let B finish the work in x days.
ATQ,
$2 \times 12 \times 8 = 12 \times 1 \times x \Rightarrow x = 16$ days

190. (d)
Eff. ↓ Total work ↓
P + Q → 24 days — 5
Q + R → 30 days — 4 → 120
R + P → 40 days — 3
2(P + Q + R) = 12
P + Q + R = 6
Eff.→ 2 3 1
ATQ,
Efficiency of 'X' = 2 × 4 = 8

Efficiency of 'Y' = $\frac{1}{2} \times 3 = \frac{3}{2}$

Efficiency of 'Z' = $2.5 \times 1 = \frac{5}{2}$

Time taken by 'X', 'Y' and 'Z' when working together = $\frac{120}{8+\frac{3}{2}+\frac{5}{2}} = 10$ days

191. (c) A B C
Eff. → 1 : 1 : 1
Change in order of work will not affect their efficiency
Thus, Work will be finished on 15 days

192. (b) Ab + An → $\frac{40}{9}$ days

$2\text{Ab} + \frac{1}{3}\text{An} \rightarrow \frac{60}{17}$ days

Total work ⇒ $\frac{40}{9}(\text{Ab} + \text{An})$

$= \frac{60}{17}\left(2\text{Ab} + \frac{1}{3}\text{An}\right)$

$\Rightarrow \frac{2}{9}\text{Ab} + \frac{2}{9}\text{An} = \frac{6}{17}\text{Ab} + \frac{1}{17}\text{An}$

$\Rightarrow \left(\frac{2}{9} - \frac{1}{17}\right)\text{An} = \left[\frac{6}{17} - \frac{2}{9}\right]\text{Ab}$

$\Rightarrow 25\text{An} = 20\text{Ab} \Rightarrow \frac{\text{An}}{\text{Ab}} = \frac{4}{5}$ (Eff.)

Total work = $\frac{40}{9} \times 9 = 40$ units

Time taken by Abha = $\frac{40}{5} = 8$ days

193. (a)
Eff. ↓ Total work ↓
B → 30 days — 3
C → 45 days — 2 → 90
ATQ,

$$\begin{array}{lcc} & \overbrace{\text{B+C}} & \overbrace{\text{A}} \\ \text{Time} & \rightarrow 6 \text{ days} & 12 \text{ days} \\ \text{Eff.} & \rightarrow \ \downarrow \times 5 & \downarrow \times n \end{array}$$

Total work → 30 + 12n = 90
⇒ 30 + 12n = 90
⇒ n = 5 [A's Eff.]

$\therefore x = \frac{90}{5} = 18$ days

194. (b) Let additional number of workers required = x
$M_1 \times D_1 = M_2 \times D_2$
$\Rightarrow 55 \times 16 = (55 + x) \times 10$
$\Rightarrow 55 \times 16 = 55 \times 10 + 10x$
$\Rightarrow x = 33$

195. (b) $\frac{M_1 \times D_1}{W_1} = \frac{M_2 \times D_2}{W_2}$

$\Rightarrow \frac{47 \times 1}{35} = \frac{x \times 1}{105}$

$\Rightarrow x = 3 \times 47 = 141$

196. (c) $\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$

$\Rightarrow \frac{7 \times 5 \times 8}{1} = \frac{M_2 \times 7 \times 10}{1} \Rightarrow M_2 = 4$

Hence, required men = 4

197. (c) Let, the total men be a

$\frac{M_1D_1H_1}{W_1} = \frac{M_2D_2H_2}{W_2}$

$\Rightarrow \frac{16 \times 18 \times 6}{24} = \frac{a \times 9 \times 12}{42}$

Total men (a) = 28
∴ Required men = 28 – 16 = 12

198. (c) $\frac{M_1 \times D_1 \times H_1}{W} = \frac{M_2 \times D_2 \times H_2}{W_1}$

$\Rightarrow \frac{18 \times 10 \times 8}{3} = \frac{25 \times x \times 6}{5}$

$\therefore x = 16$

199. (c) $\frac{M_1\ D_1}{W_1} = \frac{M_2\ D_2}{W_2}$

$\Rightarrow \frac{18 \times 10}{\frac{1}{5}} = \frac{x \times 5}{\frac{2}{5}}$

$\Rightarrow \frac{18 \times 10 \times 2}{5} = x \Rightarrow x = 72$

200. (c) $M_1 \times H_1 \times D_1 = M_2 \times H_2 \times D_2$
$\Rightarrow 30 \times 5 \times 18 = 20 \times D_2 \times 7$

$\Rightarrow D_2 = \frac{45 \times 3}{7} = 19\frac{2}{7}$ days

201. (c) $\frac{M_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2}$

ATQ,
$\Rightarrow 12 \times 9 \times 24 = 8 \times 12 \times D_2$
$\Rightarrow D_2 = 27$ days

202. (d) $M_1 \times D_1 \times H_1 = M_2 \times D_2 \times H_2$
$\Rightarrow 8 \times 18 \times 10 = 5 \times 24 \times H_2$
$\Rightarrow H_2 = 12$ hours

203. (c) $\because \frac{M_1D_1H_1}{W_1} = \frac{M_2D_2H_2}{W_2}$

$\Rightarrow \frac{30 \times 12 \times 10}{5} = \frac{x \times 16 \times 8}{8}$

$\Rightarrow x = 45$ days

204. (d) $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{25 \times 8}{5} = \frac{10 \times 16}{W_2}$

$\Rightarrow W_2 = \frac{10 \times 16 \times 5}{25 \times 8} = 4$

205. (b) $\frac{M_1D_1H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2}$

$\Rightarrow 36 \times 6 \times 10 = 24 \times 9 \times D_2$
$\Rightarrow D_2 = 10$

206. (b) $\frac{M_1 \times H_1 \times D_1}{W_1} = \frac{M_2 \times H_2 \times D_2}{W_2}$

$\Rightarrow \frac{36 \times 48}{25} = \frac{45 \times D_2}{60}$

$\Rightarrow D_2 = \frac{48 \times 48}{25} = 92.16$ days

Note:- To avoid last step calculation we can check the multiple of 9.

207. (c) $\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$

$\Rightarrow \frac{100 \times 25 \times 8}{2000} = \frac{M_2 \times 32 \times 5}{2800}$

$\Rightarrow 10 = \frac{M_2 \times 2}{35} \Rightarrow M_2 = 175$

Hence, required workers = 175

208. (c) $M_1 \times D_1 = M_2 \times D_2$
$\Rightarrow 70 \times 36 = (70 + 50) \times D_2$

$\Rightarrow D_2 = \frac{70 \times 36}{120} = 21$days

209. (a) $M_1 \times D_1 = M_2 \times D_2$
$\Rightarrow 500 \times 25 = (500 + 125) \times D_2$

$\Rightarrow D_2 = \frac{500 \times 25}{625} = 20$ days

210. (a) ATQ,

$\frac{30 \times 12}{2} = \frac{54 \times x}{1}$

$\Rightarrow x = 3\frac{1}{3}$ days

211. (a) ATQ,
$10 \times 25 = 12 \times 10 + 13 \times x$
$\Rightarrow 250 = 120 + 13x$

$\therefore x = \frac{130}{13} = 10$ days

10 days required to complete the remaining work.

212. (b) We know,
$M_1H_1 = M_2H_2$
$\Rightarrow 10 \times 6 = 12 \times H_2$
$\Rightarrow H_2 = 5$

213. (b) Let the number of committed men to do the work be x.
ATQ,
T.W. = $x \times 20 = (x - 5) \times 40$
$\Rightarrow 20x = 40x - 200$
$\Rightarrow -20x = -200 \Rightarrow x = 10$

Alternate Method:-

Days ∝ $\frac{1}{\text{Men}}$

Days = 20 : 40

$$\text{Men} = \begin{array}{c} 1 : 2 \\ \underbrace{2 : 1}_{} \\ \downarrow \ 1 \rightarrow 5 \\ 10 \end{array}$$

214. (c) ATQ,

$3N + (N - 5)18 = 15N$

$\Rightarrow 6N = 90$

$\Rightarrow N = 15$

215. (b) Let, x be the additional workers needed

$8 \times 2 + (8 + x) \times 2 = 12 \times 8$

$\Rightarrow 8 + x = 40 \Rightarrow x = 32$ workers

Alternate Method:

$10 \times 8 = (8 + x) \times 2$

$\Rightarrow x = 32$ workers

216. (b) Total work = 18×96

ATQ,

$\Rightarrow 18 \times 70$ days $= 28 \times x$ days

$$\Rightarrow x \text{ days} = \frac{18 \times 70}{28} = 45 \text{ days}$$

Total days = 45 + 26 = 71 days

217. (c) Number of students

$$\propto \frac{1}{\text{Quantity of food or no. of days}}$$

After 20 days remaining days = 30 – 20 = 10 days

and remaining student = 300 – 50 = 250

$$\begin{array}{lccc} \text{Student} \Rightarrow & 300 & : & 250 \\ & 6 & : & 5 \\ \text{Days} \Rightarrow & 5 & : & 6 \\ & \times 2 \downarrow & & \downarrow \times 2 \\ & 10 \text{ days} & & 12 \text{ days} \end{array}$$

Alternate Method:

Total food = 300×30

ATQ,

$300 \times 10 = 250 \times d$

$$\Rightarrow d = \frac{300 \times 10}{250} = 12 \text{ days}$$

218. (c) [M → Man, S → Qualified worker]

$8M \times 6 \times 10 = 20S \times 8 \times 6$

$$\Rightarrow \text{Eff. of } \frac{M}{S} = \frac{2}{1}$$

T.W. = $8 \times 2 \times 6 \times 10 = 960$ units

$$\text{Total time} = \frac{960}{(2M + 4S) \times 10}$$

$$= \frac{960}{(2 \times 2 + 4 \times 1) \times 10} = \frac{960}{80} = 12 \text{ days}$$

219. (a) Let, 15 employees left after n days.

ATQ,

$75 \times 60 = (75 \times n) + 60 \times (65 - n)$

$\Rightarrow 4500 = 75n + 3900 - 60n$

$\Rightarrow 600 = 15n$

$\therefore n = 40$ days

220. (a) ATQ,

$$\frac{(N + 18) \times 7.5 \times 20}{48\%} = \frac{(N + 12) \times 6.5 \times 30}{52\%}$$

$\Rightarrow (N + 18)5 = 6(N + 12)$

$\Rightarrow 5N + 90 = 6N + 72$

$\therefore N = 18$

221. (d) $20m \times 40 = 40w \times 60$

$$\Rightarrow \frac{m}{w} = \frac{3}{1} \text{ (Eff.)}$$

A.T.Q.,

$20m \times 40 = (10m + 20w) \times D$

$\Rightarrow 20 \times 3 \times 40 = (10 \times 3 + 20 \times 1) \times D$

$$\Rightarrow \frac{20 \times 3 \times 40}{50} = D$$

$\therefore D = 48$ days

222. (a)

$$\begin{array}{lcc} & \text{Eff.} & \text{Total work} \\ & \downarrow & \downarrow \\ 15M \to 25 \text{ days} & 8 & \\ & & 200 \\ 25W \to 40 \text{ days} & 5 & \end{array}$$

Time taken when working together

$$= \frac{200}{13} = 15\frac{5}{13} \text{ days}$$

223. (b) ATQ,

$(15M + 25W) \times 9.6$ days

$= 16W \times 27$ days

$\Rightarrow 144M + 240W = 432W$

$\Rightarrow 144M = 192W$

$$\therefore \frac{M}{W} = \frac{4}{3} \text{ (Eff.)}$$

Total Work = $16W \times 27 = 16 \times 3 \times 27$

$$\text{Time taken by 16 Men} = \frac{16 \times 3 \times 27}{16 \times 4}$$

= 20.25 days.

224. (a) ATQ,

$8M \times 10 = 10W \times 12$

$$\Rightarrow \frac{M}{W} = \frac{3}{2} \text{ (Eff.)}$$

Now, $8M \times 10 = (4M + 4W) \times D$

$\Rightarrow 8 \times 3 \times 10 = (4 \times 3 + 4 \times 2) \times D$

$\Rightarrow 240 = 20 \times D$

$\therefore D = 12$ Days

225. (a) ATQ,

$10W \times 6 = 6M \times 5$

$$\Rightarrow \frac{M}{W} = \frac{2}{1} \text{ (Eff.)}$$

Now, $10W \times 6 = (10W + 6M) \times T$

$\Rightarrow 10 \times 1 \times 6 = (10 \times 1 + 6 \times 2) \times T$

$$\therefore T = \frac{30}{11} = 2\frac{8}{11} \text{ days}$$

226. (a) ATQ,

$2M \times 6 = 3W \times 4$

$$\therefore \frac{M}{W} = \frac{1}{1} \text{ (Eff.)}$$

Total work = $2M \times 6$

$= 2 \times 1 \times 6 = 12$ unit

Time taken by 1M and 2W

$$= \frac{12}{3} = 4 \text{ days}$$

227. (c) $12M \times 8 = 4B \times 40 \Rightarrow \frac{M}{B} = \frac{5}{3}$ (Eff.)

$\therefore (12 \times 5) \times 8 = [(9 \times 3) + (3 \times 5)] \times D$

$\Rightarrow 60 \times 8 = (27 + 15) \times D$

$$\Rightarrow D = \frac{480}{42} \Rightarrow D = \frac{80}{7} \text{ days}$$

228. (b) (4 men + 7 women) × 8 = (7 men + 4 women) × 5

⇒ 32 men + 56 women = 35 men + 20 women

⇒ 36 women = 3 men

$$\Rightarrow \frac{\text{men}}{\text{women}} = \frac{12}{1}$$

Total work = $(4 \times 12 + 7 \times 1) \times 8$

$= 55 \times 8 = 440$ units

Time taken by 8 women to finish the work $= \frac{440}{8 \times 1} = 55$ days

229. (d) $6W \times 3 = 9G \times 2$

$$\Rightarrow \frac{W}{G} = \frac{1}{1} \text{ (efficiency)}$$

Total work = $6 \times 1 \times 3 = 18$ unit

Time taken by (8W + 6G)

$$= \frac{18}{14} = \frac{9}{7} \text{ days}$$

230. (b) ATQ,

$(8M + 12W) \times 4 = (6M + 14W) \times 5$

$\Rightarrow 32M + 48W = 30M + 70W$

$\Rightarrow 32M - 30M = 70W - 48W$

$\Rightarrow 2M = 22W \Rightarrow M = 11W$

$$\Rightarrow \frac{M}{W} = \frac{11}{1} \text{ (Eff.)}$$

Total Work = $(8M + 12W) \times 4$

$= (88 + 12) \times 4 = 400$ units

$$\text{Time taken by 20 women} = \frac{400}{20 \times 1}$$

= 20 days

231. (b) ATQ,

$16M \times 8 = (8M + 9W) \times 10$

$\Rightarrow 64M = 40M + 45W \Rightarrow 24M = 45W$

$$\Rightarrow \frac{M}{W} = \frac{15}{8} \text{ (eff.)}$$

Total Work = $16 \times 15 \times 8$

Time taken by 20 women

$$= \frac{16 \times 15 \times 8}{20 \times 8} = 12 \text{ days}$$

232. (d) ATQ,

$3M \times 10 = 4W \times 12 = 10L \times 6$

$$\Rightarrow \frac{5M}{40} = \frac{8W}{40} = \frac{10L}{40} \Rightarrow \frac{M}{8} = \frac{W}{5} = \frac{L}{4}$$

Total work = $30M = 30 \times 8 = 240$ units

Time taken by 4M + 4W + 4L

$$= \frac{240}{4 \times 17} = \frac{60}{17}$$

Alternate Method:

$3M \times 10 = 4W \times 12 = 10L \times 6$

$5M = 8W = 10L$

$$\begin{array}{lccccc} & M & : & W & : & L \\ \text{Eff.} \to & 8 \times 10 & : & 5 \times 10 & : & 5 \times 8 \\ & 8 & : & 5 & : & 4 \end{array}$$

Total work = $3M \times 10$

$= 3 \times 8 \times 10 = 240$ unit

ATQ,

$\Rightarrow (4M + 4W + 4L) \times n = 240$

$\Rightarrow (32 + 20 + 16) \times n = 240$

$\Rightarrow 68n = 240$

$$\therefore n = \frac{60}{17} \text{ days}$$

233. (d) (4M + 8W) × 10 Days = (5M + 24W) × 4 Days

$\Rightarrow 40M + 80W = 20M + 96W$

$$\Rightarrow 20M = 16W \Rightarrow \frac{M}{W} = \frac{4}{5}$$

Total work = $(16 + 40) \times 10 = 560$ units

Time taken by (1M + 1W)

$$= \frac{560}{4 + 5} = \frac{560}{9} = 62\frac{2}{9} \text{ days}$$

234. (d) ATQ,

$(15M + 21W) \times 56$ days

$= (12M + 24W) \times 64$ days

$\Rightarrow 105M + 147W = 96M + 192W$

$\Rightarrow 9M = 45W$

$\Rightarrow \frac{M}{W} = \frac{5}{1}$ (Eff.)

Total work = 56×96

∴ Time taken by (18 M + 24 W)

$= \frac{56 \times 96}{114} = 47\frac{3}{19}$ days

235. (b) ATQ,

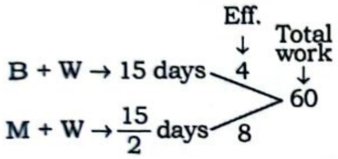
$B \times 20 = 2W \times 30$

$\Rightarrow \frac{B}{W} = \frac{3}{1}$ (Eff.)

Total work = $3 \times 20 = 60$ units

1 Woman and 1 Boy takes time together $= \frac{60}{(3+1)} = 15$ days

Man and woman finish a work together in half the time taken by a woman and boy together



Efficiency of a man = (8 – 1) = 7

Time taken by 4 man to finished the work $= \frac{60}{28} = 2.14$ days

236. (a) ATQ,

$4M = 6W$ and $4W = 6B$

$\therefore \frac{M}{W} = \frac{3}{2}$ and $\frac{W}{B} = \frac{3}{2}$

	Men		Women		Boy
	3	:	2		
			3	:	2
Efficiency →	9	:	6	:	4

Total work = $60 \times 4 = 240$ unit

Time taken by (1m + 1w) together

$= \frac{240}{15} = 16$ days

237. (d) ATQ,

$10\ W \times 16 = 6\ M \times 8$

$\Rightarrow \frac{W}{M} = \frac{3}{10}$ (Eff.)

Total work = $10 \times 3 \times 16 = 480$ unit

Work done by 12 M in 2 days

$= 12 \times 10 \times 2 = 240$ unit

Remaining work = $480 - 240 = 240$ unit

Time taken by (6M + 5W) to complete the remaining work $= \frac{240}{75} = \frac{16}{5}$ days

Total Required days

$= 2 + \frac{16}{5} = \frac{26}{5}$ days

238. (a) ATQ,

$\frac{65}{4}(1M + 4W) = \frac{13}{2}(3M + 4W)$

$\Rightarrow 5M + 20W = 6M + 8W$

$\Rightarrow 12W = M \Rightarrow \frac{W}{M} = \frac{1}{12}$ (Eff.)

Total work $= \frac{13}{2}[36 + 4] = 260$ units

∴ Time taken by 13 women

$= \frac{260}{13 \times 1} = 20$ days

239. (d) A.T.Q

$(25m + 45w) \times 15 = (15m + 60w) \times 20$

$\Rightarrow 75m + 135w = 60w + 240w$

$\Rightarrow 15m = 105w \Rightarrow \frac{m}{w} = \frac{7}{1}$

Total work $= (25 \times 7 + 45 \times 1) \times 15 = 3300$

Time taken by 69m and 67w

$= \frac{3300}{(69 \times 7 + 67 \times 1)} = \frac{3300}{550} = 6$ days.

240. (a) (2 men + 5 women) × 8 = (4 men + 6 women) × 5

$\Rightarrow 16m + 40\ W = 20m + 30W$

$\Rightarrow 4M = 10W$

$\Rightarrow \frac{M}{W} = \frac{10}{4} = \frac{5}{2}$ (Eff.)

∴ Total work $= (2 \times 5 + 5 \times 2) \times 8 = 160$ unit

So, number of men required to Complete this project in 4 days

$\Rightarrow (x \times 5) \times 4 = 160$

$\therefore x = 8$

241. (a) Let, M = Men; B = Boys

$(5M + 2B) \times 30 = (7M + 10B) \times 15$

$\Rightarrow 150M + 60B = 105M + 150B$

$\Rightarrow 150M - 105M = 150B - 60B$

$\Rightarrow 45M = 90B$

$\Rightarrow \frac{M}{B} = \frac{90}{45} = \frac{2}{1}$

Total work $= [(5 \times 2) + (2 \times 1)] \times 30$

$= 12 \times 30 = 360$ units

Efficiency of 40 men = $40 \times 2 = 80$

Time required to finish the work

= 4 days

Now, $\frac{360}{(80 + B)} = 4$

$\Rightarrow 90 = 80 + B$

$\Rightarrow B = 90 - 80 = 10$

∴ 10 boys should join to do the work

Alternate Method:-

$(5M + 2B) \times 30 = (7M + 10B) \times 15$

$\Rightarrow \frac{M}{B} = \frac{2}{1}$ (Eff.)

ATQ,

Let the number of boys be N

$(5M + 2B) \times 30 = (40M + N) \times 4$

$\Rightarrow 90 = 40 \times 2 + N$

$\Rightarrow N = 10$

Boys $= \frac{10}{1} = 10$ Boys

242. (d) $(4m + 5w)15 = (9m + 6w) \times 10$

$\Rightarrow (4m + 5w)3 = (9m + 6w) \times 2$

$\Rightarrow 12m + 15w = 18m + 12w$

$\Rightarrow 6m = 3w$

$\Rightarrow \frac{m}{w} = \frac{1}{2}$ (Eff.)

Total work $\Rightarrow (4 \times 1 + 5 \times 2)15 = (4 \times 1 + x \times 2) \times 7$

$\Rightarrow 30 = 4 + 2x$

$\therefore x = 13$

243. (a) $5M \times 20 = 10W \times 15$

$\Rightarrow \frac{M}{W} = \frac{3}{2}$

Total work = $(5 \times 3 \times 20) = 300$ unit

A.T.Q

Work done = $(2M + 6W) \times 5$

$= (2 \times 3 + 12) \times 5 = 90$ unit

Remaining work = $(300 - 90) = 210$ unit

After that, 3 woman left and a new man joined = (2M + 1M + 3W)

Time taken by the group to do remaining work $= \frac{210}{3M + 3W}$

$= \frac{210}{15} = 14$ days

244. (d) $5(4m + 6w) = 7(3m + 4w)$

$\Rightarrow 1m = 2\ w \Rightarrow m : w = 2 : 1$

Total work = $5[4(2) + 6 \times 1] = 70$ units

Let the number of men be x.

ATQ,

$\frac{5}{2} \times 70 = 5[25 + x(2)]$

$\Rightarrow 35 = 25 + 2x \Rightarrow x = 5$

245. (d) ATQ, 3G = 5S

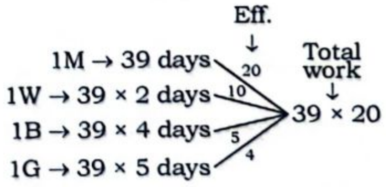
$\Rightarrow G : S = 5 : 3$

Total work = $54 \times 5 \times 3$ unit

∴ Required days $= \frac{54 \times 5 \times 3}{6 \times 5 + 8 \times 3}$

$= \frac{54 \times 5 \times 3}{54} = 15$ days

246. (d) 1M = 2W = 4B = 5G = 39 days



Time taken by 1M + 1W + 1B + 1G

$= \frac{39 \times 20}{20 + 10 + 5 + 4} = 20$ days

Alternate Method:-

M = 2W = 4B = 5G = 39 days

Let, man (M × 39)

$= \left(M + \frac{M}{2} + \frac{M}{4} + \frac{M}{5}\right) \times D$

$\Rightarrow M \times 39 = \frac{39M}{20} \times D$

$\Rightarrow D = 20$ days

247. (a) 8 Men = 16W = 32B

Eff. → 4 : 2 : 1

Total work = Eff. × Time = 32 × 8

Eff. of 4(Men + W + B)

= 4(4 + 2 + 1) = 28

$\text{Time} = \frac{\text{Total work}}{\text{Eff.}} = \frac{32 \times 8}{28} = \frac{64}{7}$

$= 9\frac{1}{7}$ months.

248. (b) 2M = 4W = 8Q

Eff. of M : W : Q = 4 : 2 : 1

Total work = 10 × 1 × 8 = 80 units

Days				Work
1st	→	Men	→	+4
2nd	→	Women	→	+2
3rd	→	Worker	→	+1

3 days ⟶ 7 unit

33 days ⟶ 77 unit

$\frac{3}{4}$ day → Men → 3 unit

$\frac{135}{4} = 33\frac{3}{4}$ days ⟶ 80 unit

249. (b) 60 Men → 20 days

80 Men → 60 days

Total work = (60 × 20) + (80 × 60) = 6000

$\therefore$ Required days = $\frac{6000}{60}$ = 100 days

Additional days = 100 – 80 = 20 days

Alternate Method:

60 M × 20 + 80 M × 60 = 60 M × n

6000 = 60n

n = 100

$\therefore$ Additional days = 100 – 80 = 20 = days

250. (d) $\frac{M_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2}$

$\Rightarrow \frac{90 \times 200}{0.5} = \frac{M_2 \times 400}{2.5} \Rightarrow M_2 = 225$

$\therefore$ Extra people = 225 – 90 = 135 workers

251. (a) Total work = 60 × 40 = 2400 units

Days	Men	Work
10	60	600 unit
10	55	550 unit
10	50	500 unit
10	45	450 unit
40		2100 unit
7.5 days	40	300 unit
47.5 days		2400 unit

Hence, total work will complete in 47.5 days

252. (b) Let the efficiency of each man be 1

Total work = 20 unit

Days →	One	two	three	four	five	Six
Men →	1	2	3	4	5	5

15 men = 15 unit

Remaining = 20 – 15 = 5

It will completed in $\frac{5}{5}$ = 1 day

Total time = 5 + 1 = 6 days

253. (b) Total Work = $(x) + (x - 10)$ ..... $(x - 60)$ = $4x$

$\Rightarrow 7x - 210 = 4x \Rightarrow 3x = 210$

$\Rightarrow x = 70$

254. (a) A + B → A → (8 + d) days, B → (18 + d) days

↓

d = $\sqrt{18 \times 8}$ = 12 days

Hence, A takes '20 days' and B takes '30 days' to do the work alone.

	Eff.	Total work
A → 20 days	3	60
B → 30 days	2	

Work done by A in 4 days = 12 units Time taken by B to complete the remaining work = $\frac{60 - 12}{2}$ = 24 day

255. (b) Required days to A and B together take to complete given work.

= $\sqrt{25 \times 16}$ = 20 days

256. (d) Let 4 men leave after x days.

A.T.Q., $10x + 6(50 - x) = 40 \times 10$

$\Rightarrow 10x + 300 - 6x = 400$

$\Rightarrow x = 25$ days

257. (c) Let, the total work = 1 unit

Given,

L + P finished 50% work then Q finished remaining work ie., 50%.

So, L + P = 0.5

Then,

Q = 1 – 0.5 = 0.5 also, P and Q together finished 60% work.

Then, P + Q = 0.6

Then, P = 0.6 – 0.5 = 0.1

So, L does = 0.5 – 0.1 = 0.4

$\therefore$ Q is most efficient among all.

258. (d) Given,

Efficiencies of P, Q, R, S

= 1 : 2 : 3 : 4

7 days total work = 1 + 2 + 3 + 4 + 1 + 2 + 3 = 16 unit

15 days total work = 16 × 2 + 1

= 33 unit

Time taken by R = $\frac{33}{3}$ = 11 days

259. (b) A can do a work in 25 days

ATQ,

5(A + B) + 5B + 5A = 36000

⇒ 10(A + B) = 36000

A can do work in 1 day worth of

= ₹ $\frac{36000}{25}$

$\therefore$ In 10 days = $\frac{36000}{25} \times 10$

= 36 × 4 × 100 = ₹14400

Alternate Method:

5(A + B) + 5B + 5A = 25A

$\Rightarrow 10A + 10B = 25A \Rightarrow \frac{A}{B} = \frac{2}{3}$

A's share = $\frac{36000}{5} \times 2$ = 14400

260. (d) LCM of 6, 8, 3 = 24

	Eff.	Total work
Arin → 6 days	4	24
Selvi → 8 days	3	
Arin + selvi + Kevin → 3 days	8	

	Arin	selvi	Kevin
Eff. →	4	3	1

$\therefore$ Kevin's Share = $\frac{7200}{8} \times 1$ = ₹ 900

261. (d) $\frac{15m \times 12}{18000} = \frac{18m \times 9}{x}$

$\Rightarrow x$ = Rs.16200

Alternate Method:

Earning of one person in 1 hr.

= $\frac{18000}{15 \times 12}$ = 100

So, Earnings of 18 person 9 hrs. in a days = 100 × 18 × 9 = Rs.16200.

262. (c)

	Eff.	T.W.
P → 12 days	3	36
Q → 9 days	4	

We know that the wages divides according to the eff. of the worker

So,

$\boxed{\begin{matrix}\text{Eff.} \propto \text{work} \\ \downarrow \\ \text{Eff.} \times \text{time}\end{matrix}}$

	P	:	Total
Wages/Eff. →	3	:	7
	↓ ×9000		↓ ×9000
	₹27,000		₹63,000

263. (b)

	Eff.	Total work
A → 10 days	6	60
B → 15 days	4	
C → 20 days	3	

Efficiency of A, B and C = 6 : 4 : 3

Wage of 'C' = $\frac{2600}{13} \times 3$ = ₹600

264. (b) ATQ,

$$\frac{(4w+7m)\times 7}{11480} = \frac{(10w+17m)\times 9}{36360}$$

On solving, $\frac{m}{w} = \frac{3}{5}$ (Eff.)

Total work = (4w + 7m) × 7

= (4×5 + 7×3) × 7= 287 unit

(11w + 9m) 13 day's work

= (11 × 5 + 9 × 3) × 13 = 82 × 13 unit

11w and 9m will earn

$= \frac{\text{Rs.}11480}{287} \times 82 \times 13 = ₹42640$

265. (b)

Eff. ↓ — Total work ↓

Ashok → 8 days — 3

Anil → 12 days — 2 — 24

Ashok + Anil + Amar → 4 days — 6

Efficiency of Amar = 6 – 5 = 1

ATQ,

(3 + 2 + 1) unit = ₹4500

Share of Amar (1 unit) = $\frac{4500}{6}$ = ₹750

266. (a)

Eff. ↓ — Total work ↓

Anita → 12 days — 3

Anand → 18 days — 2 — 36

Anita + Anand + Arun → 6 days — 6

Anita Anand Arun

Effi.→ 3 : 2 : 1

Sum of shares of Anita and Anand

$= \frac{5}{6} \times 48000 = ₹\ 40000$

267. (b)

Eff. ↓ — Total work ↓

X → 4 days — 35

Y → 5 days — 28 — 140

Z → 7 days — 20

Eff.→X + Y + Z→ 83 unit

X's share $= \frac{35}{83} \times 415 = ₹\ 175$

268. (d)

Eff. ↓ — Total work ↓

Tina → 12 days — 5 — 60

Meena → 15 days — 4

Amount will be divided in efficiency

So, (5 + 4) units = 18000

Meena (4 units) = $\frac{18000}{9} \times 4 = 8000$

269. (d)

Eff. ↓ — Total work ↓

M → 10 days — 3 — 30

R → 15 days — 2

Money is directly proportional to their efficiency.

(3 + 2) = 5 units = 4400

1 units = 880

270. (a)

Eff. ↓ — Total work ↓

Rani → 10 days — 6

Priya → 15 days — 4 — 60

Guddu → 12 days — 5

∴ Share of Priya = $\frac{9000}{15} \times 4 = 2400$

271. (d)

Eff. ↓ — Total work ↓

A → 10 days — 6

B → 20 days — 3 — 60

C → 30 days — 2

Amount distributed in their efficiency ratio.

(A + C) – B = (6 + 2) – 3 = 5

(6 + 3 + 2) units = 1100

1 units = 100

5 units = 100 × 5 = 500

272. (d)

Eff. ↓ — Total work ↓

A → 12 days — 3 — 36

B → 18 days — 2

work done by A in 2 days = 3 × 2 = 6 units

Remaining work = 36 – 6 = 30 units

36 units → ₹ 2400

30 units → $\frac{2400}{36} \times 30 = ₹2000$

273. (c)

Eff. ↓ — Total work ↓

A → 8 days — 15

B → 10 days — 12 — 120 unit

C → 12 days — 10

Amount received is in ratio of efficiencies

∴ B share $= \frac{12}{37} \times 5550 = 12 \times 150$

= 1800

Note:-

To avoid further calculation, we get answer by digital sum.

$= \frac{12}{37} \times 5550 = \frac{3 \times 6}{1} = 9$

option (c) satisfied.

274. (d) (A + B)'s one day wage = $\frac{18000}{15}$

= ₹1200

A B

Eff. → 5 : 1

∴ Daily wage of A = $\frac{5}{6} \times 1200$

= 1000

275. (c)

Eff. ↓ — Total work ↓

A → 8 days — 3 — 24

B → 12 days — 2

Work done by A and B in 4 days

= 20 unit

Efficiency of C = $\frac{4}{2} = 2$

A B C

Wok done → 12 : 8 : 4

→ 3 : 2 : 1

6 unit → 7200, 1 unit → 1200

Earnings of A, B, C respectively are

₹3600, ₹ 2400 ₹ 1200

Note:

Last step calculation avoid with help of ratio.

276. (a)

Eff. ↓ — Total work ↓

Samir → 10 days — 3 — 30

Puneet → 15 days — 2

Samir and Puneet involved Ashok then the work was completed in total 5 days

⇒ (3 + 2 + x) × 5 = 30

⇒ 25 + 5x = 30

⇒ x = 1 (efficiency of Ashok)

Amount paid to Ashok

$= \frac{4500}{6} \times 1 = 750$

⁂

13 Chapter

PIPE & CISTERN

◆ TYPE – I ◆
COMPLETELY FILLING OR EMPTYING

1. Two pipes A and B can fill a tank in 15 hours and 18 hours, respectively. Both pipes are opened simultaneously to fill the tank. In how many hours will the empty tank be filled?

SSC CPO 23/11/2020 (Shift-01)

(a) $7\frac{2}{11}$ (b) $9\frac{2}{11}$
(c) $10\frac{2}{11}$ (d) $8\frac{2}{11}$

2. Two pipes P and Q can fill a tank in 36 minutes and 45 minutes, respectively. If both pipes are opened together, the time taken to fill the tank is:

SSC CGL 13/09/2024 (Shift-03)

(a) 81 min. (b) 20 min.
(c) 40.5 min. (d) 10 min.

3. Two pipes A and B can fill a tank in 12 hours and 18 hours, respectively. Both pipes are opened simultaneously. In how much time will the empty tank be filled completely?

SSC CPO 25/11/2020 (Shift-01)

(a) 8 hours
(b) 10 hours 24 minutes
(c) 9 hours 30 minutes
(d) 7 hours 12 minutes

4. Pipe L can fill a pool in 30 hours and pipe M in 45 hours. If both the pipes are opened in an empty pool, how much time will they take to fill it?

SSC CGL 10/09/2024 (Shift-02)

(a) 24 hrs. (b) 17 hrs.
(c) 18 hrs. (d) 20 hrs.

5. Two pipes X and Y can fill a tank in 14 hours and 21 hours, respectively. Both pipes are opened simultaneously to fill the tank. In how many hours will the empty tank be filled?

SSC CGL 25/09/2024 (Shift-02)

(a) $8\frac{2}{5}$ hours (b) $6\frac{2}{5}$ hours
(c) $7\frac{2}{5}$ hours (d) $5\frac{2}{5}$ hours

6. Pipe A can fill an empty tank in 18 hours and pipe B can fill the same empty tank in 24 hours. If both the pipes are opened simultaneously, how much time (in hours) will they take to fill the empty tank?

SSC CGL 14/07/2023 (Shift-04)

(a) $11\frac{3}{7}$ (b) $10\frac{1}{7}$
(c) $10\frac{2}{7}$ (d) $11\frac{2}{7}$

7. Two pipes A and B can fill a tank in $1\frac{1}{3}$ hours and 2 hours, respectively. If both the pipe are opened simultaneously, then in how much time will the empty tank be filled?

SSC CGL 12/09/2024 (Shift-03)

(a) $1\frac{1}{4}$ hours (b) 55 minutes
(c) 48 minutes (d) $1\frac{2}{3}$ hours

8. Pipe A can fill 50% of the tank in 6 hours and pipe B can completely fill the same tank in 18 hours. If both the pipes are opened at the same time, in how much time (in minutes) will the empty tank be completely filled?

SSC CGL 26/07/2023 (Shift-02)

(a) 420 (b) 425
(c) 432 (d) 435

9. 5 pipes are required to fill a tank in 1 hour and 40 minutes. How long (in minutes) will it take to fill the same tank if 4 pipes of the same type are used?

SSC MTS 11/09/2023 (Shift- 02)

(a) 115 (b) 140
(c) 125 (d) 150

10. 15 taps can fill a tank in 36 minutes. How many taps will be required to fill the tank in one hour?

SSC CHSL 15/08/2023 (Shift-02)

(a) 12 (b) 9
(c) 8 (d) 6

11. A pipe can fill an empty tank in 5 minutes and another pipe can empty it in 6 minutes. If both pipes are opened simultaneously, how long (in minutes) will it take to fill the empty tank?

SSC CGL 13/09/2024 (Shift-02)

(a) 33 min. (b) 30 min.
(c) 35 min. (d) 25 min.

12. A tank can be filled by pipe A in 4 hours and pipe B in 6 hours. At 8:00 a.m., pipe A was opened. At what time will the tank be filled if pipe B is opened at 9:00 a.m.?

SSC CGL 23/09/2024 (Shift-01)

(a) 10:16 a.m. (b) 10:22 a.m.
(c) 10:48 a.m. (d) 10:18 a.m.

13. Pipes A, B and C can fill a tank in 20, 30 and 60 hours, respectively. Pipes A, B and C are opened at 7 a.m., 8 a.m., & 9 a.m., respectively, on the same day. When will the tank be fulled?

SSC CGL TIER-II 03/02/2022

(a) 4:40 p.m. (b) 5:40 p.m.
(c) 6:20 p.m. (d) 7:20 p.m.

14. Pipes A, B and C can fill a tank in 15, 30 and 40 hours, respectively. Pipes A, B and C are opened at 6 a.m., 8 a.m. & 10 a.m., respectively, on the same day. When will the tank be fulled?

SSC CPO 24/11/2020 (Shift-02)

(a) 3:20 p.m. (b) 11:20 p.m.
(c) 7:20 p.m. (d) 5:20 p.m.

15. Pipes A, B and C can fill a tank in 30 h, 40 h and 60 h respectively. Pipes A, B and C are opened at 7 a.m., 8 a.m. and 10 a.m. respectively on the same day. When will the tank be fulled?

SSC CGL TIER-II 11/09/2019

(a) 10:00 p.m. (b) 10:20 p.m.
(c) 9:20 p.m. (d) 9:40 p.m.

16. Pipe A and pipe B running together can fill a cistern in 6 minutes. If B takes 5 minutes more than A to fill it, then the time in which A and B will fill that cistern separately will be, respectively,________.

SSC CGL 26/07/2023 (Shift-02)

(a) 15 min and 10 min
(b) 15 min and 20 min
(c) 25 min and 20 min
(d) 10 min and 15 min

17. A tank is filled in 4 hours by three pipes A, B and C. The pipe C is $1\frac{1}{2}$ times as fast as B and B is 3 times as fast as A. How many hours will pipe A alone take to fill the tank?

SSC CGL 24/08/2021(Shift-03)

(a) 17 (b) 34
(c) 30 (d) 15

18. Fill pipe P is 21 times faster than fill pipe Q. If Q can fill a cistern in 110 minutes, find the time it takes to fill the cistern when both fill pipes are opened together.

SSC CGL 09/09/2024 (Shift-01)

(a) 5 minutes (b) 4 minutes
(c) 3 minutes (d) 6 minutes

19. One pipe can fill a tank 6 times faster than another pipe. If both the pipes together can fill the tank in 40 minutes, then in how many minutes will the slower pipe alone be able to fill the tank?

SSC CGL 24/09/2024 (Shift-01)

(a) 275 (b) 285
(c) 290 (d) 280

20. There are two pipes to fill a tank. Together, they can fill the tank in 15 minutes. If one pipe can fill the tank in one and a half times as fast as the other, the faster pipe alone can fill the tank in:

SSC CGL 11/09/2024 (Shift-01)

(a) 10 minutes
(b) 25 minutes
(c) 20 minutes
(d) $32\frac{1}{2}$ minutes

21. One pipe can fill a tank four times as fast as another pipe. If together the two pipes can fill the tank in 48 minutes, the slower pipe alone will be able to fill the tank in:

SSC CGL 26/09/2024 (Shift-01)

(a) 192 min. (b) 288 min.
(c) 240 min. (d) 144 min.

22. A tank is filled in 45 minutes by two pipes, A and B. Pipe B fills the tank twice as fast as A. How much time (in minutes) will pipe A alone take to fill the tank?

SSC CGL 26/09/2024 (Shift-03)

(a) 135 (b) 140
(c) 125 (d) 115

23. There are two pipes used to fill a tank and when operated together, they can fill the tank in 20 minutes. If one pipe can fill the tank two and a half time as quickly as the other, then the faster pipe alone can fill the tank in:

SSC CGL 13/09/2024 (Shift-01)

(a) 30 min (b) 32 min
(c) 34 min (d) 28 min

◆ TYPE – II ◆
FILLING & EMPTYING SIMULTANEOUSLY

24. A tap can fill a cistern in 10 minutes and another tap can empty it in 12 minutes. If both the taps are open, the time (in hours) taken to fill the tank will be:

SSC CGL 25/09/2024 (Shift-03)

(a) 1.5 hours (b) 2.5 hours
(c) 2 hours (d) 1 hours

25. An inlet pipe can fill a water storage tank in 11 hours and an outlet pipe can empty the completely filled tank in 15 hours .If both pipes opened simultaneously. The time taken to fill the empty tank (in hrs) is :

SSC CGL 25/09/2024 (Shift-01)

(a) $45\frac{1}{2}$ (b) $41\frac{1}{4}$
(c) $49\frac{3}{4}$ (d) 40

26. An inlet can fill an empty tank in 51 hours while an outlet pipe drains a completely-filled tank in 76.5 hours. If both the pipes are opened simultaneously when the tank is empty, in how many hours will the tank get completely filled?

SSC CHSL 08/08/2023 (Shift-01)

(a) 178.5 (b) 127.5
(c) 102 (d) 153

27. An inlet pipe can fill an empty tank in 3.6 hours, while an outlet pipe can drain a completely-filled tank in 6.3 hours. If both the pipes are opened simultaneously when the tank is empty, in how many hours will the tank get completely filled?

SSC CPO 04/10/2023 (Shift-01)

(a) 8.7 (b) 8.1
(c) 9.0 (d) 8.4

28. P can fill a tank in 5 hours. Q can fill the same tank in 10 hours. R can empty the same tank in 20 hours. How much time will all the three take together to fill the tank?

SSC CHSL 13/03/2023 (Shift-02)

(a) 10 hours (b) 4 hours
(c) 6 hours (d) 5 hours

29. Two pipes can fill a tank in 15 hours and 4 hours, respectively, while a third pipe can empty it in 12 hours. How long (in hours) will it take to fill the empty tank if all the three pipes are opened simultaneously?

SSC CPO 23/11/2020 (Shift-02)

(a) $\frac{20}{7}$ (b) $\frac{15}{7}$
(c) $\frac{50}{7}$ (d) $\frac{30}{7}$

30. Two pipes can fill a tank in 12 hours and 18 hours, respectively, while a third pipe can empty it in 8 hours. How long (in hours) will it take to fill the empty tank if all three pipes are opened simultaneously?

SSC CGL 17/09/2024 (Shift-03)

(a) 48 (b) 24
(c) 36 (d) 72

31. Pipe A can fill a tank in 12 minutes; pipe B can fill it in 18 minutes, while pipe C can empty the full tank in 36 minutes. If all the pipes are opened simultaneously, how much time will it take to fill the empty tank completely?

SSC CGL 20/07/2023 (Shift-04)

(a) 7 min. 30 sec. (b) 10 min.
(c) 9 min. (d) 6 min.

32. Pipes A and B can empty a full tank in 16 hours and 24 hours, respectively. Pipe C alone can fill the empty tank in 4 hours. If A, B and C are opened together, then 35% tank will be filled in.

SSC GD 17/11/2021 (Shift-03)

(a) $2\frac{1}{5}$ hours (b) $2\frac{2}{5}$ hours
(c) $3\frac{1}{5}$ hours (d) $3\frac{2}{5}$ hours

33. Pipe A and B can fill a tank in 12 minutes and 15 minutes, respectively. The tank when full can be emptied by pipe C in *x* minutes. When all the three pipes are opened simultaneously, the tank is full in 10 minutes. The value of *x* is :

SSC CGL TIER-II 16/11/2020

(a) 18 (b) 15
(c) 20 (d) 24

34. Pipes P and Q can completely fill a water tank in 10 hours and 15 hours, respectively. A pipe R can empty a tank filled completely with water in 12 hours. Initially, the tank is empty and only pipes P and Q are opened at 6 a.m. and pipe R is also opened at 9 a.m. By what time will the tank be completely filled?

SSC CGL 10/09/2024 (Shift-03)

(a) 1 p.m (b) 2 p.m
(c) 11 p.m (d) 3 p.m

35. Pipe A can fill a cistern in 4 hours and Pipe B can fill the same cistern in 5 hours. Pipe C can empty a full cistern in 3 hours. If all three pipes are opened together, then the time (in minutes) taken to fill the tank is: (round to the nearest minute)

SSC CGL 24/09/2024 (Shift-03)

(a) 625 (b) 445
(c) 800 (d) 514

36. An inlet pipe can fill an empty tank in 140 hours while an outlet pipe drains a completely-filled tank in 63 hours. If 8 inlet pipes and y outlet pipes are opened simultaneously, when the tank is empty, then the tank gets completely filled in 105 hours. Find the value of y.

SSC CGL 14/07/2023 (Shift-03)

(a) 1 (b) 4
(c) 3 (d) 2

37. Inlet Pipes A and B can together fill an empty tank in 1.5 hours. Outlet Pipe C, when opened alone, can empty the completely filled tank, in 4.5 hours. When only Pipes A and C are opened together, the empty tank is filled in 6 hours. Find the time taken by Pipe B, when opened alone, to fill the empty tank.

SSC CGL 19/07/2023 (Shift-02)

(a) 3 hours 30 minutes
(b) 3 hours 36 minutes
(c) 3 hours 32 minutes
(d) 3 hours 40 minutes

38. An inlet pipe can fill an empty tank in 120 hours while an outlet pipe drains a completely-filled tank in 54 hours. If 8 inlet pipes and 3 outlet pipes are opened simultaneously, when the tank is empty, then in how many hours will the tank get completely filled?

SSC CGL 20/07/2023 (Shift-01)

(a) 81 (b) 96
(c) 72 (d) 90

39. Two pipes S_1 and S_2 alone can fill an empty tank in 15 hours and 20 hours respectively. Pipe S_3 alone can empty that completely filled tank in 40 hours. Firstly both pipes S_1 and S_2 are opened and after 2 hours pipe S_3 is also opened. In how much time tank will be completely filled after S_3 is opened?

SSC CGL 21/07/2023 (Shift-02)

(a) $\frac{90}{17}$ hours (b) $\frac{89}{12}$ hours
(c) $\frac{90}{13}$ hours (d) $\frac{92}{11}$ hours

40. Each inlet pipe can fill an empty cistern in 84 hours while each drain pipe can empty the same cistern from a filled condition in 105 hours. When the cistern is empty, 9 inlet pipes and 10 outlet pipes are simultaneously opened. After how many hours will the cistern be completely filled?

SSC CGL 26/07/2023 (Shift-02)

(a) 84 (b) 88
(c) 80 (d) 90

41. There are two water taps in a tank which can fill the empty tank in 12 hours and 18 hours respectively. It is seen that there is a leakage point at the bottom of the tank which can empty the completely filled tank in 36 hours. If both the water taps are opened at the same time to fill the empty tank and the leakage point was repaired after 1 hour, then in how much time the empty tank will be completely filled?

SSC CGL 17/08/2021(Shift-02)

(a) 7 hours 12 minutes
(b) 8 hours 24 minutes
(c) 7 hours
(d) 7 hours 24 minutes

42. Pipes A, B and C can fill an empty tank in $\frac{30}{7}$ hours, if all the three pipes are opened simultaneously. A and B are filling pipes and C is an emptying pipe. Pipe A can fill the tank in 15 hours and pipe C can empty it in 12 hours. In how long (in hours) can pipe B alone fill the empty tank?

SSC CPO 24/11/2020 (Shift-01)

(a) 4 (b) 6
(c) 3 (d) 5

43. Pipe A can fill a tank in 10 hours. Pipe B can fill the same tank in 12 hours. Pipe C can empty a full tank in 16 hours. All the pipes are opened at 8:00 a.m. and pipe A and B are closed at 10:00 a.m. After how much time from starting will the tank be empty?

SSC CGL 06/06/2019 (Shift-01)

(a) 5 hours 52 minutes
(b) 5 hours 24 minutes
(c) 4 hours 30 minutes
(d) 4 hours 8 minutes

44. Pipe Q can fill the tank in 60 hours while pipe R may fill in 45 hours. Q and R pipes are opened together for 6 hours after which pipe W is also opened to empty the tank. All three pipes are opened simultaneously for 24 hours to reach the half level mark. How much time (in hours) will pipe W alone take to empty the entire tank?

SSC CGL 18/09/2024 (Shift-03)

(a) 48 (b) 42
(c) 36 (d) 30

◆ TYPE – III ◆
TAPS OPENED ALTERNATELY

45. Pipe X can fill a tank in 9 hours and Pipe Y can fill it in 21 hours. If they are opened on alternate hours and Pipe X is opened first, in how many hours shall the tank be full?

SSC CGL 19/09/2024 (Shift-01)

(a) $10\frac{3}{7}$ (b) $12\frac{3}{7}$
(c) $9\frac{3}{7}$ (d) $11\frac{3}{7}$

46. Two pipes A and B can fill an empty tank in 10 hours and 16 hours respectively. They are opened alternately for 1 hour each, opening pipe B first. In how many hours, will the empty tank be filled?

SSC CGL 20/08/2021(Shift-02)

(a) $12\frac{2}{5}$ (b) $14\frac{2}{5}$
(c) $10\frac{2}{5}$ (d) $16\frac{2}{5}$

47. An inlet pipe can fill an empty tank in $4\frac{1}{2}$ hours while an outlet pipe drains a completely filled tank in $7\frac{1}{5}$ hours. The tank is initially empty, and the two pipes are alternately opened for an hour each, till the tank is completely filled, starting with the inlet pipe. In how many hours will the tank be completely filled?

SSC CGL 21/07/2023 (Shift-02)

(a) 24 (b) $20\frac{1}{4}$
(c) $20\frac{3}{4}$ (d) $22\frac{3}{8}$

48. A tank when full can be emptied by an outlet pipe A in 5.6 hours, while an inlet pipe B can fill the same empty tank in 7 hours. If pipes A and B are turned on alternatively for 1 hour each starting with pipe A when the tank is full, how long will it take to empty the tank?

SSC CGL TIER-II (20/01/2025)

(a) 48 hours (b) 47 hours
(c) 56 hours (d) 55 hours

◆ TYPE – IV ◆
TO FIND THE CAPACITY OF TANK

49. There is a leak in a tank which empties it in 6 hours. A tap is turned on which fills the tank with 10 liters of water per minute. When it is full, it now takes 10 hours to empty. What is the capacity (in litres) of the tank?

SSC GD 18/11/2021 (Shift-02)

(a) 8000 (b) 8500
(c) 9000 (d) 10000

50. Pipe A and B fill a tank in 43.2 minutes and 108 minutes respectively. Pipe C can empty it at 3 litres/minutes. When all the three pipes are opened together, they will fill the tank in 54 minutes. The capacity (in litres) of the tank is:

SSC CGL TIER-II 15/11/2020

(a) 160 (b) 180
(c) 216 (d) 200

51. Two pipes can fill a tank separately in 36 minutes and 45 minutes respectively. A drain pipe installed in the tank can remove 40 liters of water per minute. If all three pipes are opened together, the tank is filled in one hour. Find the capacity/holding (in litres) of the tank.

SSC CHSL TIER-II 10/01/2024

(a) 600 (b) 400
(c) 300 (d) 1200

52. At a school building, there is an overhead tank. To fill this tank 50 buckets of water are required. Assume that the capacity of the bucket is reduced to two-fifth of the present. How many buckets of water are required to fill the same tank?

SSC CGL 19/09/2024 (Shift-02)

(a) 62.5 (b) 20
(c) 125 (d) 60

53. Pipe X can fill a tank in 60 hours while pipe Y can fill the tank in 72 hours. Both pipes are opened together for 20 hours. How much of the tank is left empty?

SSC CGL 18/09/2024 (Shift-01)

(a) $\frac{1}{8}$ (b) $\frac{243}{360}$
(c) $\frac{7}{18}$ (d) $\frac{3}{8}$

◆ TYPE – V ◆
LEAKAGE IN TANK

54. A pump can fill a tank with water in 1 hour. Because of a leak, it took $1\frac{1}{3}$ hours to fill the tank. In how many hours can the leak alone drain all the water of the tank when it is full?

SSC CPO 25/11/2020 (Shift-02)

(a) 2 (b) 1
(c) 4 (d) 5

55. A pump can fill a tank with water in 3 hours. Because of a leak, it took $3\frac{1}{3}$ hours to fill the tank. In how many hours can the leak alone drain all the water of the tank when it is full?

SSC CPO 24/11/2020 (Shift-02)

(a) 21 (b) 15
(c) 30 (d) 10

56. A pipe can fill a tank in 30 hours. Due to a leakage at the bottom, it is filled in 50 hours. How much time will the leakage take to empty the completely filled tank?

SSC CGL 24/07/2023 (Shift-02)

(a) 60 hours (b) 85 hours
(c) 70 hours (d) 75 hours

57. A pipe can fill an overhead tank in 12 hours. But due to a leak at the bottom, it is filled in 18 hours. If the tank is full, how much time will the leak take to empty it?

SSC CGL 09/09/2024 (Shift-03)

(a) 3.6 hours (b) 63 hours
(c) 7.2 hours (d) 36 hours

58. Pipe A usually fills a tank in 6 hours. But due to a leak at the bottom of the tank, it takes extra 2 hours to fill the tank. If the tank is full, then how much time will it take to get emptied due to the leak?

SSC CGL 11/09/2024 (Shift-02)

(a) 16 hours (b) 20 hours
(c) 12 hours (d) 24 hours

59. A tap can fill a tank in $5\frac{1}{2}$ hours. Because of a leak, it took $8\frac{1}{4}$ hours to fill the tank. In how much time (in hours) will the leak alone empty 30% of the tank?

SSC CGL TIER-II 29/01/2022

(a) $\frac{99}{20}$ (b) $\frac{5}{2}$
(c) $\frac{9}{2}$ (d) $\frac{17}{2}$

60. Two pipes A and B can fill a cistern in $12\frac{1}{2}$ hours and 25 hours, respectively. The pipes were opened simultaneously, and it was found that, due to leakage in the bottom, it took one hour 40 minutes more to fill the cistern. If the cistern is full, in how much time (in hours) will the leak alone empty 70% of the cistern?

SSC CGL TIER-II 29/01/2022

(a) 35 (b) 40
(c) 30 (d) 50

61. Two pipes A and B can fill a tank in 20 and 30 hours, respectively. Both pipes are opened to fill the tank, but when the tank is one-third full, a leak develops through which one-fourth of the water supplied by both pipes goes out. Find the total time (in hours) taken to fill the tank.

SSC CGL 23/09/2024 (Shift-03)

(a) $14\frac{2}{3}$ (b) 14
(c) $11\frac{2}{5}$ (d) $12\frac{1}{3}$

62. Pipe A and B can fill a tank in 10 hours and 40 hours, respectively. C is an outlet pipe attached to the tank. If all the three pipes are opened simultaneously, it takes 80 minutes more time than what A and B together take to fill the tank. A and B are kept open for 7 hours and then closed and C is opened. C will now empty the tank in:

SSC CGL 06/06/2019 (Shift-01)

(a) 45.5 hours (b) 38.5 hours
(c) 42 hours (d) 49 hours

63. Two pipes can fill a cistern in 12 hours and 16 hours, respectively. The pipes are opened simultaneously and it is found that due to leakage at the bottom, it takes 90 minutes more to fill the cistern. How much time will the leakage take to empty the completely filled tank?

SSC CPO 04/10/2023 (Shift-03)

(a) $39\frac{13}{49}$ h (b) $36\frac{29}{49}$ h
(c) $37\frac{15}{49}$ h (d) $38\frac{10}{49}$ h

◆ TYPE – VI ◆
WHEN 1 OR 2 TAPS ARE CLOSED DURING THE FILLING OR EMPTYING A TANK

64. Two taps P and Q can fill a tank alone in 10 hours and 12 hours respectively. If the two taps are opened at 9 a.m., then at what time should the tap P be closed to completely fill the tank at exactly 3 p.m.?

SSC MTS 16/06/2023 (Shift-01)

(a) 2 p.m (b) 1 p.m
(c) 3 p.m (d) 12 p.m

65. Pipes A and B can fill a tank in 18 hours and 27 hours, respectively, whereas pipe C can empty the full tank in 54 hours. All three pipes are opened together, but pipe C is closed after 12 hours. In how much time (in minutes) will the one-third of the remaining part of the tank be filled by A and B together?

SSC Phase XII 21/06/2024 (Shift-02)

(a) 24 (b) 36
(c) 30 (d) 15

66. Pipes A, B and C can fill a tank in 30 hours, 36 hours and 28 hours, respectively. All the three pipes were opened simultaneously. If A and C were closed 5 hours and 8 hours, respectively, before the tank was filled completely, then in how many hours was the tank filled?

SSC MTS 08/10/2021 (Shift-03)

(a) 14 (b) 15
(c) 12 (d) 16

67. Pipes A and B can fill a tank in 12 hours and 16 hours respectively and pipe C can empty the full tank in 24 hours. All three pipes are opened together, but after 4 hours pipe B is closed. In how many hours, the empty tank will be completely filled?

SSC CGL 23/08/2021(Shift-01)

(a) 18 (b) 32
(c) 28 (d) 14

68. Pipe A and B can fill a tank in 16 hours and 24 hours respectively, and pipe C alone can empty the full tank in x hours. All the pipes were opened together at 10.30 a.m., but C was closed at 2.30 p.m. If the tank was full at 8.30 p.m. on the same day, then what is the value of x?

SSC CGL TIER-II 12/09/2019

(a) 64 (b) 48
(c) 45 (d) 96

69. Pipes M, N and S can fill a tank in 25, 50 and 100 minutes, respectively. Initially, pipes N and S are kept open for 10 minutes, and then pipe N is shut while pipe M is opened. Pipe S is closed 15 minutes before the tank overflows. How much time (in minutes) will it take to fill the tank if the three pipes work in this pattern?

SSC CGL 09/09/2024 (Shift-02)

(a) 30 (b) 33
(c) 42 (d) 27

70. Three pipes P, Q and R can fill a cistern in 40 minutes, 80 minutes and 120 minutes, respectively. Initially, all the pipes are opened. After how much time (in minutes) should the pipes Q and R be turned off so that the cistern will be completely filled in just half an hour?

SSC CGL 10/09/2024 (Shift-01)

(a) 14 (b) 10
(c) 16 (d) 12

71. Two pipes, A and B, can fill a tank in 10 minutes and 20 minutes, respectively. The pipe C can empty the tank in 30 minutes. All the three pipes are opened at a time in the beginning. However, pipe C is closed 2 minutes before the tank is filled. In what time, will the tank be full (in minutes)?

SSC CGL 12/09/2024 (Shift-01)

(a) 12 (b) 10
(c) 8 (d) 6

72. Two pipes A and B can fill a tank in 48 minutes and 66 minutes, respectively. If both the pipes are opened simultaneously, then after how many minutes should pipe B be closed so that the tank gets filled in 32 minutes?

SSC CGL 12/09/2024 (Shift-02)

(a) 18 (b) 16
(c) 22 (d) 20

73. Pipes A and B can fill a tank in 15 hours and 25 hours, respectively, whereas pipe C can empty the full tank in 40 hours. All three pipes are opened together, but pipe A is closed after 5 hours. After how many hours will the remaining part of the tank be filled?

SSC CGL 17/09/2024 (Shift-01)

(a) $41\frac{4}{9}$ (b) $43\frac{4}{9}$
(c) $44\frac{4}{9}$ (d) $39\frac{4}{9}$

74. Pipes A and B can fill a tank in 6 hours and 8 hours, respectively. Both pipes are opened together for 3 hours. After that pipe A is closed, and B continues to fill the tank. In how many hours will the tank be filled?

SSC CGL 18/09/2024 (Shift-02)

(a) 2 (b) 4
(c) 3 (d) 6

75. Two inlet pipes, P_1 and P_2, can fill a cistern in 20 hours and 30 hours, respectively. They were opened at the same time, but pipe P_1 had to be closed 5 hours before the cistern was full. How many hours in total did it take for the two pipes to fill the cistern?

SSC CGL 19/09/2024 (Shift-03)

(a) 15 hrs. (b) 9 hrs.
(c) 12 hrs. (d) 10 hrs.

76. Three pipes, P, Q and R, together take four hours to fill a tank. All the three pipes were opened at the same time. After three hours, P was closed, and Q and R filled the remaining tank in two hours. How many hours will P alone take to fill the tank?

SSC CGL 23/09/2024 (Shift-02)

(a) 8 hours (b) 10 hours
(c) 12 hours (d) 9 hours

77. There are 3 taps A, B and C in a tank. These can fill the tank in 10 hours, 20 hours and 25 hours, respectively. At first, all three taps are opened simultaneously. After 2 hours, tap C is closed and tap A and hours B keep running. After 4 hours, tap B is also closed. The remaining tank is filled by tap A alone. Find the percentage of work done by tap A itself.

SSC CPO 10/11/2022 (Shift-02)

(a) 75% (b) 52%
(c) 72% (d) 32%

78. Two pipes A and B can fill a tank in 12 minutes and 24 minutes, respectively, while a third pipe C can empty the full tank in 32 minutes. All the three pipes are opened simultaneously. However, pipe C is closed 2 minutes before the tank is filled. In how much time (in minutes) will the tank be full?

SSC CGL TIER-II 03/02/2022

(a) 9 (b) 10
(c) 12 (d) 8

79. Pipes A and B can empty a full tank in 36 minutes and 45 minutes, respectively, whereas pipe C alone can fill the tank in 15 minutes. B and C are opened together for 15 minutes, and then both are turned off and A is opened. Pipe A will empty the tank (in minutes);

SSC CHSL 19/04/2021 (Shift-02)

(a) 20 (b) 24
(c) 30 (d) 18

80. Pipes A and B can fill a tank in 16 hours and 24 hours, respectively, whereas pipe C can empty the full tank in 40 hours. All three pipes are opened together, but pipe A is closed after 10 hours. After how many hours will the remaining part of the tank be filled?

SSC CPO 23/11/2020 (Shift-01)

(a) $15\frac{1}{2}$ (b) $12\frac{1}{2}$
(c) 20 (d) 10

81. Pipes A and B can fill a tank in 16 hours and 24 hours, respectively, whereas pipe C can empty the full tank in 40 hours. All three pipes are opened together, but pipe C is closed after 10 hours. After how many hours will the remaining part of the tank be filled?

SSC CPO 25/11/2020 (Shift-01)

(a) 2 (b) $2\frac{1}{2}$
(c) 5 (d) $5\frac{1}{2}$

82. Pipe A and B are filling pipes while C is an emptying pipe. A and B can fill a tank in 72 minutes and 90 minutes respectively. When all the three pipes are opened together, the tank gets filled in 2 hours. A and B are opened together for 12 minutes, then closed and C is opened. The tank will be empty after

SSC CGL TIER-II 13/09/2019

(a) 15 minutes (b) 18 minutes
(c) 12 minutes (d) 16 minutes

83. Pipes A and B can fill a tank in one hour and two hours respectively while pipe C can empty the filled up tank in one hour and fifteen minutes. A and C are turned on together at 9 a.m. After 2 hours, only A is closed and B is turned on. When will the tank be emptied?

SSC CGL 06/06/2019 (Shift-01)

(a) 12:10 p.m.
(b) 11:30 a.m.
(c) 10:30 a.m.
(d) 12:20 p.m.

84. A cistern can be filled by two pipes in 8 minutes and 10 minutes, separately. Both the pipes are opened together for a certain time, but due to an obstruction, only $\frac{5}{8}$ of the full quantity of water flowed through the former pipe and $\frac{3}{5}$ through the latter pipe. However, the obstruction was suddenly removed, and the cistern was filled in 3 minutes from that moment. How long did it take before the full flow began?

SSC CGL 17/09/2024 (Shift-02)

(a) $3\frac{1}{16}$ minutes (b) $2\frac{6}{17}$ minutes
(c) $9\frac{6}{7}$ minutes (d) $2\frac{30}{37}$ minutes

85. Pipe A takes $\frac{4}{5}$ of the time required by pipe B to fill an empty tank individually. When an outlet pipe C is also opened simultaneously with pipes A and B, it takes $\frac{4}{5}$ more time to fill the empty tank than it takes when only pipe A and pipe B are opened together. If it takes 40 hours to fill the tank when all the three pipes are opened simultaneously, in what time (in hours) will pipe C empty the full tank, operated alone?

SSC CGL 24/09/2024 (Shift-02)

(a) 50 hours (b) 45 hours
(c) 65 hours (d) 75 hours

86. Pipe A and B can fill a tank in 10 hours and 40 hours, respectively. C is an outlet pipe attached to the tank. If all the three pipes are opened simultaneously, it takes 80 minutes more time than what A and B together take to fill the tank. A and B are kept open for 7 hours and then closed and C is opened. C will now empty the tank in :

SSC CGL 06/06/2019 (Shift-01

(a) 45.5 hours
(b) 38.5 hours
(c) 42 hours
(d) 49 hours

87. When operated separately, pipe A takes 5 hours less than pipe B to fill a cistern and when both pipe are operated together, the cistern get filled in 6 hours. In how much time (in hours) will pipe B fill the cistern, if operated?

SSC CPO 23/11/2020 (Shift-03)

(a) 9
(b) 18
(c) 10
(d) 15

88. The tank is filled by three pipes with different uniform flow rates. While the first two pipes are operating simultaneously, they fill the tank in the same duration that the third pipe takes to fill it alone. The second pipe can fill the tank 5 hours quicker than the first pipe, yet 4 hours slower than the third pipe. What is the time (in hours) needed for the first pipe to fill the tank?

SSC CGL 11/09/2024 (Shift-03)

(a) 18 (b) 12
(c) 9 (d) 15

◆

ANSWER KEY

1.	(d)	2.	(b)	3.	(d)	4.	(c)	5.	(a)	6.	(c)	7.	(c)	8.	(c)	9.	(c)	10.	(b)
11.	(b)	12.	(c)	13.	(b)	14.	(a)	15.	(c)	16.	(d)	17.	(b)	18.	(a)	19.	(d)	20.	(b)
21.	(c)	22.	(a)	23.	(d)	24.	(d)	25.	(b)	26.	(d)	27.	(d)	28.	(b)	29.	(d)	30.	(d)
31.	(c)	32.	(b)	33.	(c)	34.	(d)	35.	(d)	36.	(c)	37.	(b)	38.	(d)	39.	(d)	40.	(a)
41.	(d)	42.	(a)	43.	(a)	44.	(c)	45.	(b)	46.	(a)	47.	(c)	48.	(b)	49.	(c)	50.	(c)
51.	(d)	52.	(c)	53.	(c)	54.	(c)	55.	(c)	56.	(d)	57.	(d)	58.	(d)	59.	(a)	60.	(a)
61.	(a)	62.	(d)	63.	(d)	64.	(a)	65.	(a)	66.	(b)	67.	(a)	68.	(d)	69.	(d)	70.	(d)
71.	(c)	72.	(c)	73.	(d)	74.	(b)	75.	(a)	76.	(a)	77.	(c)	78.	(b)	79.	(b)	80.	(b)
81.	(a)	82.	(b)	83.	(d)	84.	(b)	85.	(a)	86.	(d)	87.	(d)	88.	(d)				

SOLUTIONS

1. (d) A → 15 hrs 6
B → 18 hrs 5
90

Time taken by A and B to fill the empty tank $= \frac{90}{11} = 8\frac{2}{11}$ hours

Alternate Method:

Time taken to fill the empty tank

$= \frac{15 \times 18}{15 + 18} = \frac{15 \times 18}{33} = 8\frac{2}{11}$ hrs

2. (b)
Eff. ↓ Total capacity ↓
P → 36 min. 5
Q → 45 min. 4
180

Time taken by both pipes to fill the tank $= \frac{180}{5+4} = 20$ min.

3. (d) A → 12 hours 3
B → 18 hours 2
36

Total time taken $= \frac{36}{3+2} = \frac{36}{5}$

= 7 hrs 12 min.

Alternate Method:-

Total time taken $= \frac{12 \times 18}{12 + 18}$

$= \frac{12 \times 18}{30} = 7$ hr 12 min.

4. (c)
Eff. ↓ Capacity ↓
L → 30h 3
M → 45h 2
90 units

Time taken by both pipe to fill

$= \frac{90}{3+2} = 18$ hrs.

5. (a)
Eff. ↓ Total capacity ↓
X → 14 hours 3
Y → 21 hours 2
42

Time required to fill tank

$= \frac{42}{3+2} = \frac{42}{5} = 8\frac{2}{5}$ hours

Alternate Method:

$\frac{14 \times 21}{14 + 21} = \frac{42}{5} = 8\frac{2}{5}$ hours

6. (c) A → 18 h 4
B → 24 h 3
72

Time taken by A and B to fill the tank

$= \frac{72}{4+3} = \frac{72}{7} = 10\frac{2}{7}$ h

Alternate Method:

$\frac{18 \times 24}{18 + 24} = \frac{72}{7} = 10\frac{2}{7}$ h

7. (c)
Eff. ↓ Total capacity ↓
A → $\frac{4}{3}$ hrs. 3
B → 2 hrs. 2
4

Time taken by both pipes to fill the tank $= \frac{4}{3+2} = \frac{4}{5}$ hr. $= \frac{4}{5} \times 60$ min.
= 48 min.

8. (c) A → 12 hrs 3
B → 18 hrs 2
36

Time taken by pipe A & B to fill the tank $= \frac{36}{5} \times 60 = 432$ min

9. (c) $\frac{M_1H_1D_1}{W_1} = \frac{M_2H_2D_2}{W_2}$

ATQ,

$5 \times \frac{5}{3} = 4 \times T_2$

$\Rightarrow T_2 = \frac{25}{12}$ hours $= \frac{25}{12} \times 60$ minutes
= 125 minutes

Alternate Method:

Efficiency $\propto \frac{1}{\text{time}}$

5 : 4
4 : 5
↓ ↓
100 125 min

10. (b) Fill a tank capacity = (15 × 36 min)
To fill the tank in 1 hour

Required Tap $= \frac{15 \times 36}{60} = 9$

11. (b)
Eff. ↓ Total capacity ↓
A → 5 min 6
B → 6 min –5
30

∴ Required time $= \frac{30}{6-5} = 30$ mins

12. (c)
Eff. ↓ Total capacity ↓
A → 4 hrs 3
B → 6 hrs 2
12

Let capacity of tank be 12 units
ATQ,
$A + x(A + B) = 12$

$\Rightarrow 3 + 5x = 12 \Rightarrow x = \frac{9}{5}$ hrs

∴ Total time $= \frac{9}{5} + 1 = \frac{14}{5}$ hrs.

$= 2$ hrs $+ \frac{4}{5}$ hrs = 2 hrs 48 min

Time = 8 am. + 2 hrs 48 min
= 10 : 48 am

Alternate Method:

Eff. ↓ Total capacity ↓
A → 4 hrs. 3
B → 6 hrs. 2
12

Tank filled by A in 1 hr. = 3 units
Remaining part = 12 – 3 = 9 units
Time taken by A and B to fill remaining part $= \frac{9}{5} = 1\frac{4}{5}$ hrs.

= 1 hr. 48 min.
∴ Time = 9 am. + 1 hr. 48 min.
= 10 : 48 am.

13. (b) 7AM A → 20 hrs 3
8AM B → 30 hrs 2
9AM C → 60 hrs 1
60

By A till 9 AM = 2 × 3 = 6 units
By B till 9 AM = 2 × 1 = 2 units
Remaining work = 60 – (6 + 2) = 52 units

Required time $= \frac{52}{6} = 8\frac{2}{3}$ hrs

= 8 hrs 40 min

Time = 9 AM + 8 hrs 40 min = 5 : 40 PM

14. (a)

$$\left.\begin{array}{ll} A \to 15\text{ hrs} & 8 \\ B \to 30\text{ hrs} & 4 \\ C \to 40\text{ hrs} & 3 \end{array}\right\rangle 120$$

By A from 6 am to 10 am = 4 × 8 = 32 unit

By B from 8 am to 10 am = 2 × 4 = 8 unit

Total work done = 32 + 8 = 40 unit

Remaining work = 120 – 40 = 80 unit

Time taken by A, B and C to fill 80 units $= \frac{80}{8+4+3} = \frac{80}{15} = \frac{16}{3}$

= 5 hours 20 minutes

Thus, Tank will be filled at 3 : 20 pm

15. (c)

$$\left.\begin{array}{ll} A \to 30\text{ hrs} & 4 \\ B \to 40\text{ hrs} & 3 \\ C \to 60\text{ hrs} & 2 \end{array}\right\rangle 120$$

7:00 AM ←
8:00 AM ← +3hr
10:00 AM ← +2hr

By A from 7 to 10 a.m. = 3 × 4 = 12 units

By B from 8 to 10 a.m. = 2 × 3= 6 units

Remaining work = (120 – 18) = 102 units

Time taken by (A + B + C) $= \frac{102}{9}$

$= 11\frac{3}{9}$ = 11 hr 20 min

So, tank will be filled in

= 10:00 AM + 11 hr 20 min

= 9:20 PM

16. (d) Do it by option

So, option (d) satisfies the given conditions

$$\left.\begin{array}{ll} A \to 10\text{ min} & 6 \\ B \to 15\text{ min} & 4 \end{array}\right\rangle 60$$

$A + B \to \frac{60}{10} = 6$ min & B – A = 5 minutes (satisfied)

17. (b)

$$\begin{array}{ccccc} A & : & B & : & C \\ & & (2 & : & 3)_{\times 3} \\ (1 & : & 3)_{\times 2} & & \\ \hline 2 & : & 6 & : & 9 = 17 \end{array}$$

Total capacity = 4 × 17 = 68 units

Time taken by A to fill the tank

$= \frac{68}{2} = 34$hr

18. (a)

$$\begin{array}{lccc} & P & : & Q \\ \text{Eff.} \to & 21 & : & 1 \end{array}$$

Total capacity = 110 × 1 = 110 units

Time taken by both the pipes when opened together $= \frac{110}{21+1}$

$= \frac{110}{22} = 5$ min.

19. (d) **I^st^ pipe** **IInd pipe**

$$\begin{array}{lccc} & \textbf{I}^{\textbf{st}}\textbf{ pipe} & & \textbf{II}^{\textbf{nd}}\textbf{ pipe} \\ \text{Efficiency} \to & 6 & : & 1 \end{array}$$

Total capacity of tank

= efficiency × time

= 7 × 40 = 280 unit

∴ time required by slower pipe to fill tank $= \frac{280}{1} = 280$ min

20. (b)

$$\begin{array}{lccc} & \text{Tank I} & & \text{Tank II} \\ \text{Eff} \to & 3 & : & 2 \end{array}$$

Total work = 15 × 5 units

∴ Time taken by faster pipe

$= \frac{15 \times 5}{3} = 25$ min

21. (c)

$$\begin{array}{lcc} & P_1 & P_2 \\ \text{Eff.} \to & 4 & 1 \end{array}$$

Capacity of Tank = Eff. × time

= 5 × 48 = 240 unit

Time taken by slower pipe $= \frac{240}{1}$

= 240min.

22. (a) A + B → 45 min

$$\begin{array}{lccc} & A & : & B \\ \text{Efficiency} \to & 1 & : & 2 \end{array}$$

Let, capacity of tank = 3 × 45

∴ Time taken by A $= \frac{3 \times 45}{1}$

= 135 min

23. (d) Let pipe be X and Y

ATQ,

$X = \frac{5}{2}Y$

Efficiency of X : Y = 5 : 2

Total capacity of tank = 20 × 7 = 140 unit

Time taken by faster pipe

$= \frac{140}{5} = 28$ min

24. (d)

$$\begin{array}{lcl} & \text{Eff.}\downarrow & \text{Total capacity}\downarrow \\ P^{+} \to 10\text{ min.} & 6 & \\ & & 60 \\ Q^{-} \to 12\text{ min.} & -5 & \end{array}$$

Eff. of P and Q = 6 – 5 = 1

Time taken by P and Q to fill the tank

$= \frac{60}{1} = 60$ min. = 1 hrs.

Alternate Method:-

$\frac{12 \times 10}{12-10} = \frac{60}{1} = 60$ min. = 1 hrs.

25. (b)

$$\begin{array}{lcl} & \text{Eff.}\downarrow & \text{Total capacity}\downarrow \\ P_1^{+} \to 11\text{h} & 15 & \\ & & 165 \\ P_2^{-} \to 15\text{h} & -11 & \end{array}$$

Time taken by $(P_1^{+} + P_2^{-})$ to fill the tank $= \frac{165}{(15-11)} = \frac{165}{4}$

$= 41\frac{1}{4}$ hour

26. (d)

$$\left.\begin{array}{ll} A \to 51\text{ h} & 3 \\ B \to \frac{153}{2}\text{ h} & 2 \end{array}\right\rangle 153$$

Required time $= \frac{153}{3-2} = 153$ hrs.

27. (d)

$$\left.\begin{array}{ll} \text{Inlet} \to 3.6\text{ h} & +7 \\ \text{Outlet} \to 6.3\text{ h} & -4 \end{array}\right\rangle 25.2$$

Then, required time

$= \frac{25.2}{7-4} = \frac{25.2}{3} = 8.4$ hrs.

Alternate Method:

Required time $= \frac{3.6 \times 6.3}{6.3 - 3.6}$

$= \frac{3.6 \times 6.3}{2.7} = 8.4$ hrs.

28. (b)

$$\left.\begin{array}{ll} P \to 5\text{ h} & 4 \\ Q \to 10\text{ h} & 2 \\ R \to 20\text{ h} & -1 \end{array}\right\rangle 20$$

Time taken to fill the tank

$= \frac{20}{4+2-1} = \frac{20}{5} = 4$ hrs.

29. (d)

$$\left.\begin{array}{ll} \text{I} \to 15\text{ hrs} & 4 \\ \text{II} \to 4\text{ hrs} & 15 \\ \text{III} \to 12\text{ hrs} & -5 \end{array}\right\rangle 60$$

Total time taken by three pipes to fill empty tank $= \frac{60}{4+15-5}$

$= \frac{60}{14} = \frac{30}{7}$ hours

30. (d)

$$\begin{array}{lcl} & \text{Eff.}\downarrow & \text{Total capacity}\downarrow \\ P \to 12\text{ hrs.} & 6 & \\ Q \to 18\text{ hrs.} & 4 & 72 \\ R \to 8\text{ hrs.} & -9 & \end{array}$$

Time taken by them to fill the empty tank $= \frac{72}{6+4-9} = 72$ hrs.

31. (c)

$$\left.\begin{array}{ll} A \to 12\text{ min} & 3 \\ B \to 18\text{ min} & 2 \\ C \to 36\text{ min} & -1 \end{array}\right\rangle 36$$

Time taken to fill the tank

$= \frac{36}{3+2-1} = \frac{36}{4} = 9$ min

32. (b)

$$\left.\begin{array}{ll} A \to 16\text{ h} & -3 \\ B \to 24\text{ h} & -2 \\ C \to 4\text{ h} & 12 \end{array}\right\rangle 48$$

Work done by (A + B + C) in 1 hour

= (12 – 3 – 2) = 7

Time taken to fill 35% of the tank

$= \frac{48 \times 35}{7 \times 100} = \frac{12}{5} = 2\frac{2}{5}$ hours

33. (c)

$$\left.\begin{array}{ll} A^{+} \to 12\text{ min} & 5 \\ B^{+} \to 15\text{ min} & 4 \\ A^{+} + B^{+} + C^{-} \to 10\text{ min} & 6 \end{array}\right\rangle 60$$

$$\begin{array}{lccc} & A^{+} & B^{+} & C^{-} \\ & \downarrow & \downarrow & \downarrow \\ \text{Eff.} \to & 5 & 4 & 3 \end{array}$$

Time taken by pipe C to empty the tank $= \frac{60}{3} = 20$ minutes

34. (d)

$$\begin{array}{lcl} & \text{Eff.}\downarrow & \text{Total capacity}\downarrow \\ P \to 10\text{ hrs.} & 6 & \\ Q \to 15\text{ hrs.} & 4 & 60 \\ R \to 12\text{ hrs.} & -5 & \end{array}$$

Tank filled by P and Q in 3 hrs. (6 : 00 a.m. to 9 : 00 a.m.) = (6 + 4) × 3
= 30 units
Remaining part = 60 – 30 = 30 units
Time taken by P, Q and R to fill remaining part = $\frac{30}{6+4-5}$
= $\frac{30}{5}$ = 6 hrs.
∴ Time = 9:00 a.m. + 6 hrs.
= 3:00 p.m.

35. (d) L.C.M of 4, 5 & 3 = 60

Eff. ↓ Total capacity ↓
A^+ → 4h 15
B^+ → 5h 12 60
C^- → 3h −20

$A^+ + B^+ + C^- = 7$
Time taken by all three pipe to fill the tank = $\frac{60}{7}$ hr.
= $\frac{60\times60}{7}$ = 514 min.

36. (c) Inlet → 140 h 9
1260
Outlet → 63 h 20

ATQ.
$8 \times 9 - 20 \times y = \frac{1260}{105}$
⇒ 72 – 20y = 12
⇒ 20y = 60
⇒ y = 3

37. (b) A + B → 1.5 = $\frac{3}{2}$ h 12
C → 4.5 = $\frac{9}{2}$ h −4 18
A + C → 6 = 6 h 3

∵ Efficiency of A + C = 3
⇒ A – 4 = 3
⇒ A = 7
Efficiency of B = 12 – 7 = 5
Time taken by B to fill the tank
= $\frac{18}{5}$ = 3 hours 36 minutes

38. (d) Inlet → 120 h 9
1080
Outlet → 54 h 20

For 8 inlet pipes = 8 × 9 = 72
For 3 outlet pipes = 3 × 20 = 60
Time taken to fill the tank completely
= $\frac{1080}{72-60} = \frac{1080}{12}$ = 90 hours

39. (d) S_1 → 15 h 8
S_2 → 20 h 6 120
S_3 → 40 h −3

Part of the tank filled in two hour by pipe S_1 and S_2 = 2 × (8 + 6) = 28 unit
Remaining = (120 – 28) = 92 unit
Time taken to completely fill the tank after pipe S_3 is opened = $\frac{92}{(8+6-3)}$
= $\frac{92}{11}$ hr

40. (a) I → 84 hrs 5
420
O → 105 hrs −4

Part of the tank filled by 9 Inlet pipe and 10 Outlet pipe in 1 hour
= [9 × 5 + 10 × – 4] = 5
Time taken = $\frac{420}{5}$ = 84 hours

41. (d) I → 12 hr 3
II → 18 hr 2 36
III → 36 hr −1

In 1 hr, 3 + 2 – 1 = 4 units
Remaining work = 36 – 4 = 32 units
Time = $\frac{32}{5} = 6\frac{2}{5}$ hrs = 6 hrs 24 min
Total time = 1 hr + 6 hrs 24 min
= 7 hrs 24 min

42. (a) $A^+ + B^+ + C^-$ → $\frac{30}{7}$ h 14
A^+ → 15 h 4 60
C^- → 12 h −5

B's efficiency = [14 – (4 –5)] = 15
Time taken by B to fill the tank
= $\frac{60}{15}$ = 4 hours

43. (a) A → 10 hrs 24
B → 12 hrs 20 240
C → 16 hrs −15

All pipe are opened at 8:00 AM and pipe (A and B) are closed at 10:00 AM
So, (24 + 20 – 15) × 2 hr = (44 – 15) × 2
= 29 × 2 = 58 unit
Time taken by C to empty the tank
= $\frac{58}{15}$hr = 3hr $\frac{13}{15}$ × 60 min
= 3 hr 52 min
So, Total Time = (2 hr + 3 hr 52 min)
= 5 hr 52 min

44. (c)

Eff. ↓ Total capacity ↓
Q → 60 hrs. 3
180
R → 45 hrs. 4

Tank filled by Q and R in 6 hrs.
= 6 × (3 + 4) = 42 units
To fill half tank, remaining part
= 90 – 42 = 48 units
Eff. of Q, R and W^- = $\frac{48}{24}$ = 2
Eff. of W^- = 7 – 2 = 5
Time taken by W to empty the tank
= $\frac{180}{5}$ = 36 hrs.

45. (b)

Eff. ↓ Total capacity ↓
X → 9 hrs 7
63
Y → 21 hrs 3

Starting from 'X'
Hour Pipe Work
1st → X → 7
2nd → Y → 3
2 hr. ×6 → 10×6 unit
12 hr. → 60 unit
$\frac{3}{7}$ hr. → X → 3 unit
$12\frac{3}{7}$ hr. → 63 unit

∴ Total time = $12\frac{3}{7}$ hours.

46. (a) A → 10 hrs 8
80
B → 16 hrs 5

Hours Pipe Work
1st → B → 5
2nd → A → 8
2 hrs×6 → 13×6
12 hrs → 78 unit
$\frac{2}{5}$ hrs → B → 2 unit
$12\frac{2}{5}$ hrs → 80 unit

47. (c) Inlet → $\frac{9}{2}$ h 8
36
Outlet → $\frac{36}{5}$ h −5

Hours Pipe Work
1st → Inlet → 8
2nd → Outlet → –5
2 hrs×10 → 3×10
20 hrs → 30 unit
$\frac{6}{8}$ hrs → Inlet → 6 unit
$20\frac{6}{8}$ hrs → 36 unit

Time taken to fill the tank completely
= $20\frac{6}{8} = 20\frac{3}{4}$ hrs

48. (b)

Outlet (A) → 5.6 hours −10
56 (total capacity)
inlet (B) → 7 hours 8

each 2 hours empty the tank = 2 unit
↓×23 ↓×23
46 hours 46 unit
1 hours 10 unit
47 hours 56 unit

Hence 47 hours to empty the tank

49. (c)

Leak → 6 hrs −5
30
Fill + Leak → 10 hrs −3
↓ ↓
Eff.→2 –5

Total capacity of tank = 30 unit
Tap efficiency on flow = 10 ltr/min × 60 min = 600 ltr/hr
2 unit/hour = 600 ltr/hour
1 unit = 300 ltr
Total capacity of tank = 30 unit = 30 × 300 = 9000 ltr

50. (c)

$A^{\cdot} \to 43.2$ min — 5

$B^{\cdot} \to 108$ min — 2 > 216

$A^{\cdot} + B^{\cdot} + C^{\cdot} \to 54$ min — 4

Eff. → 5, 2, −3

Capacity = 216 × 1L = 216

51. (d) Let drain pipe is C

Eff. ↓ Capacity ↓

$A \to 36$ min — 5

$B \to 45$ min — 4 > 180

$A + B - C \to 60$ min — 3

Eff. of C = 6

6 unit → 40 L

$180 \text{ unit} \to \frac{40}{6} \times 180 = 1200 \text{ L}$

∴ Capacity of tank = 1200 L

52. (c) Capacity of tank = $\frac{50}{1}$ buckets

New number = $50 \times \frac{5}{2} = 125$ buckets

53. (c)

Eff. ↓ Total capacity ↓

$X \to 60$ hours — 6

> 360

$Y \to 72$ hours — 5

Tank filled by pipe X and Y in 20 hours = 20 × (6 + 5) = 220

Empty tank = 360 − 220 = 140

∴ Part of empty tank = $\frac{140}{360} = \frac{7}{18}$

54. (c)

$A \to 1$ hrs — 4

> 4

A + leakage → $\frac{4}{3}$ hrs — 3

Eff. → 4, 1

Time taken by leakage pipe to empty the tank = $\frac{4}{1} = 4$ hours

Alternate Method:

Required time = $x\left(\frac{x+t}{t}\right)$

$= \frac{1\left(1+\frac{1}{3}\right)}{\frac{1}{3}} = \frac{4}{3} \times 3 = 4$ hrs

55. (c)

Total time → 3 h — 10

> 30

Time with leakage → $\frac{10}{3}$ h — −9

Time taken by drain to leak the water of the tank

$= \frac{30}{10-9} = 30$ hours

Alternate Method:

Required time = $x\left(\frac{x+t}{t}\right)$

$= \frac{3\left[3+\frac{1}{3}\right]}{\frac{1}{3}} = 3\left[\frac{10}{3}\right] \times 3 = 30$ hrs

56. (d)

$A \to 30$ hrs — 5

> 150

A + Leakage → 50 hrs — 3

Eff. → 5, −2

Time taken to empty the tank

$= \frac{150}{2} = 75$ h

Alternate Method:-

Required time = $\frac{x(x+t)}{t}$

Where, x = normal time taken to fill the tank

t = extra time due to leakage.

∴ time taken to empty the full tank

$= \frac{30(30+20)}{20} = 75$ hours.

57. (d) Let the leak pipe be B.

Eff. ↓ Total Capacity ↓

$A \to 12$h — 3

> 36

$A + B \to 18$h — 2

Eff. → 3, −1

Time taken by leak pipe to empty the tank = $\frac{36}{1} = 36$ hours.

Alternate Method:

Required time = $\frac{x(x+t)}{t}$

$= \frac{12(12+6)}{6} = 36$ hours.

58. (d)

Eff. ↓ Total capacity ↓

A →6 hour — 4

> 24

(A + B) →8 hour — 3

Effi → +4, −1

∴ Time required to empty the tank

$= \frac{24}{1} = 24$ hours.

Alternate Method:-

Required time = $\frac{x(x+t)}{t}$

$= \frac{6(6+2)}{2} = 24$ hours

59. (a)

$A \to \frac{11}{2}$ hrs — 6

> 33

$A + \overline{L} \to \frac{33}{4}$ hrs — 4

$\overline{L}$ ↓ 2

Required time = $\frac{33}{2} \times \frac{30}{100} = \frac{99}{20}$ hrs.

60. (a)

$A \to \frac{25}{2}$ h — 2

> 25

$B \to 25$ h — 1

Time taken by (A + B) = $\frac{25}{3}$ hrs.

Time taken by (A + B + L)

$= \frac{25}{3} + \frac{5}{3} = 10$hr

Efficiency of (A + B + L) → $\frac{25}{10} = 2.5$

∴ Eff. of L = 3 − 2.5 = 0.5

Time taken to empty 70% of tank

$= \frac{70 \times 25}{100 \times 0.5} = 35$ hr

Alternate Method:-

$A \to \frac{25}{2}$ h — 2

> 25

$B \to 25$ h — 1

Time taken by (A + B) = $\frac{25}{3}$ hrs.

Now,

Time, taken to empty 70% tank due to leak = $\frac{x(x+t)}{t}$

$= \frac{\frac{25}{3}\left[\frac{25}{3}+\frac{5}{3}\right]}{\frac{5}{3}} \times \frac{70}{100}$

$= \frac{25}{3} \times \frac{30}{5} \times \frac{70}{100} = 35$ hrs.

61. (a)

Eff. ↓ Total capacity ↓

$A \to 20$h — 3

> 60

$B \to 30$h — 2

$\frac{1}{3}$rd of capacity = $60 \times \frac{1}{3} = 20$ unit

Time taken by both pipe to fill 20 unit = $\frac{20}{5} = 4$ hr

But due to leak, $\frac{1}{4}$ water goes out

∴ Eff. of A + B = $\frac{3}{4} \times 5 = \frac{15}{4}$

Time taken by A + B to fill the remaining capacity of the tank

$= \frac{40}{\frac{15}{4}} = \frac{32}{3} = 10\frac{2}{3}$ hour

∴ Total time taken = 4h + $10\frac{2}{3}$ h

$= 14\frac{2}{3}$ hour

62. (d)

$A \to 10$ hrs — 4

> 40

$B \to 40$ hrs — 1

Time taken by A and B to fill the tank

$= \frac{40}{5} = 8$ hours

When, all 3 pipes opened then the time taken = 8 hours + 80 min

$= \frac{28}{3}$ hours

$A^{\cdot} \to 10$ hrs — 28

$B^{\cdot} \to 40$ hrs — 7 > 280

$A^{\cdot} + B^{\cdot} + C^{\cdot} \to \frac{28}{3}$ hrs — 30

Eff. → 28, 7, −5

(A + B)7 + C × t = 0

⇒ 35 × 7 − 5t = 0

⇒ 35 × 7 = 5t ⇒ t = 49 hrs

Alternate Method:-

A → 10 hrs 4
40
B → 40 hrs 1

A + B → $\frac{40}{5}$ = 8 hrs = x

Now, Required time

$= \frac{x(x+t)}{t} \times \frac{7}{8}$

[∵ (A + B) were opened for 7 hrs]

$= \frac{8\left(8+\frac{4}{3}\right)}{\frac{4}{3}} \times \frac{7}{8}$

= 49 hours

63. (d) A → 12 h 4
48
B → 16 h 3

Let the leakage pipe is C

ATQ,

$\Rightarrow \frac{48}{A+B+C} - \frac{48}{A+B} = \frac{90}{60}$

$\Rightarrow \frac{48}{7-C} - \frac{48}{7} = \frac{3}{2}$

$\Rightarrow 48\left(\frac{(7-7+C)}{7(7-C)}\right) = \frac{3}{2}$

$\Rightarrow \frac{C}{49-7C} = \frac{1}{32} \Rightarrow 32C = 49 - 7C$

$\Rightarrow C = \frac{49}{39}$ (Eff.)

Now time taken by C to empty the tank $= \frac{48}{\frac{49}{39}} = \frac{48 \times 39}{49} = 38\frac{10}{49}$hr

Alternate Method:

A → 12 h 4
48
B → 16 h 3

ATQ,

A and B has to work for extra 90 minutes.

$\Rightarrow (A+B) \times \frac{90}{60} = C\left[\frac{48}{7} + \frac{90}{60}\right]$

$\Rightarrow 7 \times \frac{3}{2} = C \times \frac{96+21}{14}$

$\Rightarrow \frac{7 \times 3}{2} = C \times \frac{117}{14}$

$\Rightarrow C = \frac{49}{39}$

Time taken by C to empty the tank

$= \frac{48 \times 39}{49} = 38\frac{10}{49}$ hrs.

Alternate Method:

Required time = $x\frac{(x+t)}{t}$

A → 12 4
48
B → 16 3

⇒ time by (A + B) = $\frac{48}{7}$ = x

∴ Required time $= \frac{\frac{48}{7}\left(\frac{48}{7} + \frac{90}{60}\right)}{\frac{90}{60}}$

$= \frac{48}{7}\left[\frac{48}{7} + \frac{3}{2}\right] \times \frac{2}{3} = \frac{48}{7} \times \frac{96+21}{14} \times \frac{2}{3}$

$= \frac{48}{7} \times \frac{117}{14} \times \frac{2}{3} = \frac{48 \times 39}{49} \approx 39$

⇒ Slightly less than 39

from options:- $38\frac{10}{49}$

64. (a) P → 10 h 6
60
Q → 12 h 5

ATQ,

Let tap P be closed after t hours.

Then,

⇒ t(P + Q) + (6 – t)Q = 60

⇒ 11t + 30 – 5t = 60

⇒ 6t = 30 ⇒ t = 5 hrs.

i.e., P should be closed at 2:00 pm

Alternate Method:

P → 10 6 → Efficiency
60 → Total Capacity
Q → 12 5

Let tap P is not closed before Q at 3 pm.

So, tap P and tap Q work for 6 hours

Total work = (6 + 5) × 6 = 66 units.

If tap P is not closed than tank would fill 66 units, 6 unit extra filled by tap P.

Required time to fill 6 unit water

$= \frac{6}{6}$ = 1 hour.

It mean tap P had been closed at 2 pm.

Alternate Method:

We know, required time

$= y\left(1 - \frac{t}{x}\right)$

Where, y = time taken by P

x = time taken by Q

t = time to fill completely

$= 10\left(1 - \frac{6}{12}\right)$ = 5 hrs

∴ It should be closed at 2 : 00 pm

65. (a)

A → 18 hours 3
B → 27 hours 2 54 unit
C → 54 hours –1

Tank filled in 12 hrs.

= (3 + 2 – 1) × 12 = 48unit

Remaining part = 54 – 48 = 6 unit

$\frac{1}{3^{rd}}$ of Remaining part

$= 6 \times \frac{1}{3}$ = 2 unit

Required time = $\frac{2}{3+2}$ hr.

$= \frac{2}{5} \times 60$ = 24 min.

66. (b) ATQ,

LCM of 30, 36 & 28 = 1260

A → 30 h 42
B → 36 h 35 1260
C → 28 h 45

work done by A in 5 hours

= 5 × 42 = 210 unit

work done by C in 8 hours

= 8 × 45 = 360 unit

Total work = 1260 + 210 + 360

= 1830 unit

Total time taken = $\frac{1830}{122}$ = 15 hours

67. (a) A → 12 hrs 4
B → 16 hrs 3 48
C → 24 hrs –2

Work done by (A + B + C) in 4 hrs.

= (4 + 3 – 2) × 4 = 20 unit

Remaining part = (48 – 20) = 28 unit

Time taken by A and C to fill the remaining part = $\frac{28}{4-2}$ = 14 hrs.

Total time to fill the tank completely = 4 + 14 = 18 hrs.

68. (d) A → 16 hrs 3
48
B → 24 hrs 2

Let the efficiency of pipe C be 'K'.

Pipe A and B work for = 10:30 AM to 8:30 PM = 10 hour

Pipe C work for = 10:30 to 2:30 pm = 4 hour

ATQ,

⇒ 10 (3 + 2) – 4K = 48

⇒ 10 × 5 – 4K = 48

⇒ 4K = 50 – 48

⇒ K = $\frac{1}{2}$

Time taken by pipe C to empty the tank = $\frac{48}{\frac{1}{2}}$ = 48 × 2 = 96 hours.

69. (d)

Eff. ↓ Total capacity ↓
M → 25 min 4
N → 50 min 2 100
S → 100 min 1

Tank filled by N and S in 10 min

= 10 × (2 + 1) = 30 units

Remaining part = 100 – 30 = 70 units

Tank filled by S in 15 minutes

= 15 × 1 = 15 units

Now, total capacity = 70 + 15 = 85 units

Time taken by pipe M and S to fill 85 units = $\frac{85}{4+1}$ = 17 min

∴ Total time = 10 + 17 = 27 min.

70. (d)

Eff. ↓ Total capacity ↓

P → 40 min. — 6

Q → 80 min. — 3 — 240

R → 120 min. — 2

Tank filled by P in 30 min. = 30 × 6 = 180 units

Remaining part = 240 – 180

= 60 units

Time taken by Q and R to fill remaining part = $\frac{60}{3+2}$ = 12 min.

∴ After 12 min, Q and R should be turned off.

Alternate Method:-

Q → 80 — 3

R → 120 — 2 — 240

time (Q + R) = $\frac{240}{5}$ = 48 mins

∴ Required time = $y\left(1-\frac{t}{x}\right)$

= $48\left(1-\frac{30}{40}\right) = 48 \times \frac{10}{40}$ = 12 min

71. (c)

Eff. ↓ Total capacity ↓

A → 10 min — 6

B → 20 min — 3 — 60

C → 30 min — –2

Let, the tank was fill in 'x' min

ATQ,

x(A + B) + (x – 2)C = 60

⇒ 9x + (–2x) + 4 = 60

⇒ 7x = 56

⇒ x = 8min

72. (c)

Eff. ↓ Total capacity ↓

A → 48 — 11 — 528

B → 66 — 8

Tank filled by pipe A in 32 min = 32 × 11 = 352 unit

Remaining part = 528 – 352

= 176 unit

∴ Time taken by pipe B = $\frac{176}{8}$

= 22 min

Then, after 22 min pipe B should be closed.

Alternate Method:

Required time = $y\left(1-\frac{t}{x}\right)$

= $66\left(1-\frac{32}{48}\right)$

= 66 × $\frac{16}{48}$ = 22 min.

73. (d)

Eff. ↓ Total capacity ↓

A' → 15 hrs — 40

B' → 25 hrs — 24 — 600

C → 40 hrs — 15

Tank filled by pipe A, B and C in 5 hrs. = (40 + 24 – 15) × 5 = 245 units

Remaining part = 600 – 245 = 355 units

Time taken by B and C to fill remaining part = $\frac{355}{24-15}$

= $\frac{355}{9} = 39\frac{4}{9}$ hrs.

74. (b)

Eff. ↓ Total capacity ↓

A → 6 — 4 — 24

B → 8 — 3

ATQ,

3(A + B) + xB = 24

⇒ 21 + 3x = 24

⇒ $x = \frac{3}{3}$ = 1

∴ Tank will be filled in 3 + 1

= 4 hrs

Alternate Method:

Let tank is filled in 't' hours

⇒ $3 = 6\left(1-\frac{t}{8}\right)$

⇒ $\frac{1}{2} = \frac{8-t}{8}$

⇒ 4 = 8 – t

⇒ t = 4 hrs.

75. (a)

Eff. ↓ Total capacity ↓

P1 → 20 hrs. — 3 — 60

P2 → 30 hrs. — 2

Tank filled by pipe P1 in 5 hrs.

= 3 × 5 = 15 unit

Total capacity = 60 + 15 = 75 unit

Time taken by them to fill the cistern

= $\frac{75}{3+2} = \frac{75}{5}$ = 15 hrs.

76. (a) Let, total capacity of tank = 1

Tank filled by P, Q and R in hr. = $\frac{1}{4}$

Tank filled in 3 hrs (P, Q and R) = $\frac{3}{4}$

Remaining part = 1 – $\frac{3}{4} = \frac{1}{4}$

Remaining part filled by Q and R in 2 hours = $\frac{1}{4}$

Then, Tank filled in 1 hour

= $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

P's one hour work = $\frac{1}{4} - \frac{1}{8} = \frac{1}{8}$

Hence, P can fill tank in 8 hours.

Alternate Method:

(P + Q + R) × 1 = (Q + R) × 2

⇒ P + Q + R = 2Q + 2R

⇒ P = Q + R

∴ Eff. ratio of P : Q + R = 1 : 1

Total capacity = (1 + 1) × 4 = 8 unit

∴ Time taken by P = $\frac{8}{1}$ = 8 hr.

77. (c)

A → 10 hrs — 10

B → 20 hrs — 5 — 100

C → 25 hrs — 4

Eff.→ A + B + C = 19

$$\underbrace{A+B+C}_{2h} \quad \underbrace{A+B}_{2h} \quad \underbrace{A}$$

↓×19 ↓×15 ↓

Work→ 38 + 30 + A = 100

A = 32

Percentage of total work done by A

= $\frac{10\times4+32}{100}\times100$ = 72%

78. (b)

A → 12 min — 8

B → 24 min — 4 — 96

C → 32 min — –3

2 min work of C = 2 × (–3) = –6units

Total work = 96 – 6 = 90 units

Time taken to fill the tank

= $\frac{90}{8+4-3} = \frac{90}{9}$ = 10 min

79. (b)

A → 36 min — –5

B → 45 min — –4 — 180 unit

C → 15 min — 12

Now,

(B + C) × 15 = 8 × 15 = 120 units

Time taken by A to empty 120 units

= $\frac{120}{5}$ = 24 min

80. (b)

A → 16 hrs — 15

B → 24 hrs — 10 — 240

C → 40 hrs — –6

Total work done by (A + B + C) in 10 hours = (15 + 10 – 6) × 10 = 190 units

Remaining work = 240 – 190 = 50 units

Time taken by B and C to do remaining work = $\frac{50}{10-6} = \frac{50}{4}$

= $12\frac{1}{2}$ hours

81. (a)

A → 16 hrs — 15

B → 24 hrs — 10 — 240

–C → 40 hrs — –6

(A + B + C)'s 10 hours work done

= (15 + 10 – 6) × 10 = 190 units

Remaining work = 240 – 190 = 50 units

Time taken by A and B to do remaining work = $\frac{50}{15+10}$ = 2 hours

82. (b)
A' → 72 min — 5
B' → 90 min — 4 → 360
A' + B' + C → 120 min — 3
Eff. → 5, 4, –6

Work done by pipe A and B in 12 minutes = (5 + 4) × 12 = 108 units

Time taken by pipe C = $\frac{108}{6}$ = 18 min.

83. (d)
A → 1 hrs — 10
B → 2 hrs — 5 → 10
C → $\frac{5}{4}$ hrs — –8

Given that,

(A and C) are turned on together at 9:00AM for 2 hours = (10 – 8) × 2 = 2 × 2 = 4 unit (only 4 unit tank fill)

After that,

(A) is closed and (B) is turned on.

3 unit → 1 hours

4 unit → $\frac{1}{3}$ × 4 hrs. = 1hours 20 min

9:00 AM — 11:00 AM — 12:20 p.m.
2 hr — 1 hr 20 min

84. (b)
Eff. ↓, Total capacity ↓
A → 8 min — 5
B → 10 min — 4 → 40

ATQ.

$$\Rightarrow \left(5\times\frac{5}{8}+4\times\frac{3}{5}\right)t+(3\times 9)=40$$

$$\Rightarrow \left(\frac{25}{8}+\frac{12}{5}\right)t=13$$

$$\Rightarrow t=\frac{520}{221}=\frac{40}{17}=2\frac{6}{17}\text{ min}$$

85. (a) More

$\frac{4}{5}$) + = $\frac{9}{5}$

Time ↓, Eff. ↓, Total capacity ↓
4x — 5
5x — 4 → 20x

ATQ,

$$A+B\Rightarrow\frac{20x}{5+4}=\frac{20x}{9}\text{ hours}$$

$$\Rightarrow(5+4-C)\times\frac{20x}{9}\times\frac{9}{5}=20x$$

$$\Rightarrow 9-C=5\Rightarrow C=4$$

Total work = (5 + 4 – 4) × 40

= 200 units

∴ Time taken by C = $\frac{200}{4}$ = 50hr.

86. (d)
A → 10 hrs — 4
B → 40 hrs — 1 → 40

Time taken by A and B to fill the tank

$$=\frac{40}{(4+1)}=\frac{40}{5}=8\text{ hrs}$$

If all three pipe A, B and outlet pipe C open, time taken to fill the tank

$$=(8\text{ hr}+80\text{ min})=9+\frac{1}{3}=\frac{28}{3}\text{ hour}$$

So,

A' → 10 hrs — 28
B' → 40 hrs — 7 → 280
A' + B' + C⁻ → $\frac{28}{3}$ hrs — 30
Eff. → 28, 7, –5

Work done by A and B in 7 hrs = (28 + 7) × 7 = 35 × 7 = 245 units

So time taken by pipe C to empty the tank = $\frac{245}{5}$ = 49 hrs

87. (d)
A ← B, A + B
$x-5$, x, 6

$$\therefore t_{A+B}=\frac{(x-5)(x)}{2x-5}$$

$$\Rightarrow 6=\frac{(x-5)(x)}{2x-5}\Rightarrow 12x-30=x^2-5x$$

$$\Rightarrow x^2-17x+30=0$$

$$\Rightarrow x^2-15x-2x+30=0$$

$$\Rightarrow x(x-15)-2(x-15)=0$$

$$\Rightarrow (x-15)(x-2)=0$$

$$\Rightarrow x=15$$

Alternate Method:

Let, B can fill the tank in x hour

A → $(x-5)$ hours

A & B → 6 hours

So, $\frac{1}{(x-5)}+\frac{1}{x}=\frac{1}{6}$

x = 15(satisfies the equation)

Hence,

B can fill the cistern in 15 hours.

88. (d)

	Ist	IInd	IIIrd
Time →	$x+5$	x	$x-4$

ATQ,

$$\frac{1}{x+5}+\frac{1}{x}=\frac{1}{x-4}$$

$$\Rightarrow\frac{2x+5}{x^2+5x}=\frac{1}{x-4}$$

$$\Rightarrow 2x^2-8x+5x-20=x^2+5x$$

$$\Rightarrow x^2-8x-20=0$$

$$\Rightarrow (x-10)(x+2)=0$$

$$\Rightarrow x=-2\text{ (Not possible)},\ x=10$$

Time taken by first pipe = $x+5$

= 10 + 5 = 15 hours

Alternate Method:

	Ist	:	IInd	:	IIIrd
Time →	$x+9$	:	$x+4$	:	x

$x=\sqrt{9\times 4}=6$

∴ Time taken by first pipe

= $x+9$ = 6 + 9 = 15 hrs.

SELECTION मंत्र #04

"How to complete so many questions of this book in less time?"

#Hacks:-

- **Solve 3-4 similar questions** – Once you understand the concept, skip questions that only have different values but the same method.
- **Follow the 70% Rule** – If you solve 70% of the questions while marking the calculative & conceptual ones with a star (★), then in the second round, you only need to solve the marked questions.
- **Prioritize quality over quantity** – Focus on learning patterns and shortcuts instead of solving every question blindly.

Tip: Smart selection of questions + strategic revision = faster syllabus completion & better retention!

14
Chapter

TIME & DISTANCE

• TYPE – I •
BASIC QUESTIONS

1. Which of the following is NOT a correct statement?
SSC CGL 05/12/2022 (Shift- 03)
(a) The speed of 20 m/s is less than the speed of 85 km/h.
(b) Time may be calculated by dividing the distance by the speed.
(c) Covering the same distance in lesser time implies a higher speed.
(d) The speed of 99 km/h is less than the speed of 24 m/s.

2. A man crosses a road 1600 m long in 4 minutes. What is his speed (in km/h) ?
SSC GD 16/11/2021 (Shift-01)
(a) 22 (b) 14
(c) 24 (d) 20

3. A man runs 200 metres in 24 seconds. His speed is:
SSC CHSL 02/06/2022 (Shift- 03)
(a) 30 km/h (b) 32 km/h
(c) 24 km/h (d) 33 km/h

4. A bus covered a distance of 162 km. If speed of this bus is 15 m/s, then what will be the time taken?
SSC CGL TIER - II 08/08/2022
(a) 3 hours (b) 2 hours
(c) 5 hours (d) 4 hours

5. The speed of wind during a storm is 10^5 mm per sec. How long (in seconds) will it take a dust particle suspended in air to travel 1 km?
SSC MTS 05/10/2021 (Shift-01)
(a) 0.01 (b) 1
(c) 10 (d) 0.1

6. A bus is running at a speed of 60 km/h to cover a distance in 50 min. To reduce the time of the journey to 20 min, at what speed (in km/h) should the bus run?
SSC Phase XI 27/06/2023 (Shift-02)
(a) 120 (b) 90
(c) 140 (d) 150

7. With a uniform speed, a car covers a distance in 16 hours. Had the speed been increased by 20 km/h, the same distance would have been covered in 12 hours. The total distance covered by the car is:
SSC CHSL 10/07/2024 (Shift-03)
(a) 720 km (b) 1080 km
(c) 960 km (d) 480 km

8. A car covers a certain distance in 85 minutes, if it runs at a speed of 36 km/hr. The speed at which the car must run to reduce the time of journey to 51 minutes will be:
SSC CHSL 04/07/2024 (Shift-03)
(a) 70 km/hr (b) 80 km/hr
(c) 60 km/hr (d) 50 km/hr

9. A man walking at the speed of 5 km/h covers a certain distance in 3 hours 45 minutes. If he covers the same distance by a cycle in 2 hours 10 minutes, then the speed of the cycle in km/h is:
SSC CHSL 01/07/2024 (Shift-01)
(a) $9\frac{11}{26}$ (b) $5\frac{11}{26}$
(c) $7\frac{16}{26}$ (d) $8\frac{17}{26}$

10. A man walking at the speed of 4 km/h covers a certain distance in 6 hours and 15 minutes. If he covers the same distance by cycle in 5 hours and 10 minutes, then the speed of the cycle in km/h is:
SSC CHSL 10/07/2024 (Shift-04)
(a) $3\frac{21}{31}$ (b) $3\frac{11}{31}$
(c) $2\frac{9}{31}$ (d) $4\frac{26}{31}$

11. To reach at a destination, D takes 45 minutes if he drives at a speed of 60 km/h. Due to some urgency, he is to reach the destination in 30 minutes. What should be his speed in km/h?
SSC CHSL 05/07/2024 (Shift-02)
(a) 80 (b) 75
(c) 90 (d) 60

12. If a car runs at a speed of 60 km/h and takes 180 minutes to cover a certain distance, then what time will it take to cover the same distance at a speed of 40 km/h?
SSC CPO 29/06/2024 (Shift-03)
(a) 3 hr (b) 4 hr 30 min
(c) 3 hr 45 min (d) 3 hr 15 min

13. A man can cover a certain distance in 2 hours and 10 minutes if he walks at the rate of 12 km/hr. If he covers the same distance on cycle at the rate of 13 km/hr, then find the time taken by him.
SSC CHSL 20/03/2023
(a) 90 minutes (b) 110 minutes
(c) 120 minutes (d) 115 minutes

14. If a car covers 90 km using 4 litres of petrol, how much distance (in km) will it cover using 32 litres of petrol?
SSC Phase XII 25/06/2024 (Shift-04)
(a) 720 (b) 650
(c) 710 (d) 680

15. The distance between P and Q is 720 km. A train leaves P at 6 am and runs at a speed of 20 m/s. The train stops on the way for 1 hour 30 minutes. At what time train will reach at Q ?
SSC CHSL 17/03/2023 (Shift-01)
(a) 5 : 00 pm (b) 4 : 45 pm
(c) 5 : 15 pm (d) 5 : 30 pm

16. A bus travels at 100 km/h for the first 1/2 hour. Later it travels at 80 km/h. Find the time taken by the bus to travel 290 km.
SSC CPO 10/11/2022 (Shift-03)
(a) 4 hours (b) 3.5 hours
(c) 3 hours (d) 2.5 hours

17. A journey of 900 km is completed in 11 h. If $\frac{2}{5}$ of the journey is completed at the speed of 60 km/h, at what speed (in km/h) is the remaining journey completed?
SSC CGL 12/04/2022 (Shift - 03)
(a) 108 (b) 72
(c) 84 (d) 90

18. A car moves at a speed of 108 km/hr after repairing and moves at the speed of 72 km/hr before repairing. It covers a distance of x km in 3 hours after repairing. How much time will it take to cover a distance of $5x$ km before repairing ?
SSC CHSL 14/03/2023 (Shift-02)
(a) 25 hrs 20 min
(b) 24 hrs
(c) 20 hrs 40 min
(d) 22 hrs 30 min

19. Vipin travels one-third of the distance of a journey at a speed of 30 km/h and the remaining distance at a speed of 40 km/h. If he took a total of 12 hours to complete the journey, what was the total distance (in km) of the journey?
SSC CGL TIER-II 26/10/2023
(a) 445 (b) 450
(c) 412 (d) 432

20. Jimmy has to cover a distance of 88 km in 16 hours. If she covers half of the journey in $\frac{3}{4}$ time, then what should be her speed to cover the remaining distance in the time left?
SSC CPO 04/10/2023 (Shift-03)
(a) 12 km/h (b) 10 km/h
(c) 13 km/h (d) 11 km/h

21. A man decided to cover a distance of 12 km in 78 minutes. He decided to cover the initial two-thirds of the distance at 10km/h and the remaining at some different speed. Find the speed for the last one-third of the distance.

SSC CHSL 07/08/2023 Shift-01

(a) 7.8 km/h (b) 8 km/h
(c) 8.4 km/h (d) 9 km/h

22. A man starts from a place A and reaches the place B in 50 hours. He travels $\frac{1}{4}$ distance at the speed of 5 km/hr and the remaining distance at the speed of 15 km/hr. What is the distance between A and B?

SSC MTS 17/05/2023 (Shift-01)

(a) 525 km (b) 500 km
(c) 375 km (d) 425 km

23. Tom travelled 285 km in 6 hours. In his total travelling, he travelled the first part by bus at 40 km/hr and the remaining part by train at 55 km/hr. How much distance has he travelled by train?

SSC CHSL 11/07/2024 (Shift-04)

(a) 155 km (b) 120 km
(c) 165 km (d) 135 km

24. Yug covers a certain distance with a speed of 56 km/h in $\frac{3}{2}$ hours. If he wants to cover the same distance in 7 hours, what would be his speed (in km/h)?

SSC MTS 04/09/2023 (Shift- 02)

(a) 12 (b) 20
(c) 16 (d) 14

◆ TYPE – II ◆
WHEN SPEED IS INCREASED/DECREASED

25. If Ram covers a certain journey at 60% of his usual speed, he reaches the destination late by 36 min. His usual time (in min) to reach the destination is:

SSC CGL 01/12/2022 (Shift- 04)

(a) 60 (b) 72
(c) 50 (d) 54

26. Moving at $\frac{6}{7}$ of its usual speed, a bus is 20 minutes late. What is its usual time to cover the journey?

SSC CHSL 02/07/2024 (Shift-02)

(a) 2 hours (b) 4 hours
(c) 1.5 hours (d) 3 hours

27. A vehicle is going at one-fourth of its usual speed and it takes an extra 45 minutes to reach its destination. Its usual time to cover the same distance is:

SSC CPO 04/10/2023 (Shift-03)

(a) 20 minutes (b) 15 minutes
(c) 10 minutes (d) 30 minutes

28. A boy increases his speed to $\frac{9}{5}$ times of his original speed. By doing this, he reaches his school 40 minutes before the usual time. How much time (in minutes) does he take usually?

SSC CPO 24/11/2020 (Shift-2)

(a) 120 (b) 30
(c) 90 (d) 45

29. Two cars run to a place at the speeds of 45 km/h and 55 km/h, respectively. If the second car takes 40 minutes less than the first for the journey, then what is the length of the journey (in km)?

SSC CPO 27/06/2024 (Shift-02)

(a) 145 (b) 165
(c) 180 (d) 99

30. If a person walks at 18 km/hr instead of 12 km/hr, he would have walked 24 km more. What is the actual distance travelled by him?

SSC MTS 14/09/2023 (Shift- 02)

(a) 60 km (b) 48 km
(c) 55 km (d) 52 km

31. A lady walks to her office every day from home and maintains a fixed time for the same. On one day she decreases her speed by 25%. By what fraction of her usual time will she be late on that day?

SSC MTS 12/10/2021 (Shift-02)

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$
(c) $\frac{1}{6}$ (d) $\frac{2}{3}$

32. A takes 3 hours more than B to walk 'd' km. If A doubles his speed, then he can make it in 1 hour less than B. How much time (in hours) does A require to walk 'd' km?

SSC CGL 19/04/2022 (Shift -01)

(a) 5 (b) 9
(c) 8 (d) 4

33. A takes 8 hours more than the time taken by B to cover a distance of 160 km. If A doubles his speed, he takes 3 hours more than B to cover the same distance. The speed (in km/h) of B is:

SSC CGL 17/08/2021 (Shift 01)

(a) 72 (b) 80
(c) 70 (d) 75

34. To cover a distance of 416 km, a train A takes $2\frac{2}{3}$ hours more than train B. If the speed of A is doubled, It would take $1\frac{1}{3}$ hours less than B. What is the speed (in km/h) of train A?

SSC CGL TIER-II 13/09/2019 (Shift-01)

(a) 56 (b) 54
(c) 52 (d) 65

35. A takes 30 minutes more than B to cover a distance of 15 km at a certain speed. But if A doubles his speed, he takes one hour less than B to cover the same distance. What is the speed (in km/hr) of B?

SSC CGL 04/06/2019 (Shift-01)

(a) 6 (b) 5
(c) $6\frac{1}{2}$ (d) $5\frac{1}{2}$

◆ TYPE – III ◆
WHEN DISTANCE IS CONSTANT AND TOTAL TIME IS GIVEN

36. A person travels from one place to another at 60 km/hr and returns at 75 km/hr. If the total time taken is 6 hours, then find the total distance travelled.

SSC CHSL 05/07/2024 (Shift-04)

(a) 300 km (b) 240 km
(c) 250 km (d) 400 km

37. Ram goes to his office from his house at a speed of 8 km/h and returns at a speed of 2 km/h. If he takes four hours in going and coming back, find the distance between the house and the office.

SSC Phase XII 21/06/2024 (Shift-04)

(a) 6.4 km (b) 5.3 km
(c) 7.4 km (d) 6.3 km

38. A man goes from his house to a vegetable market at the speed of 15 km/h and walked back at the speed of 10 km/h. If the whole journey took 2 hours 30 minutes, find the distance from his house to the vegetable market (in km).

SSC MTS 14/09/2023 (Shift- 03)

(a) 15 (b) 18
(c) 12 (d) 20

39. A man completes a journey in ten hours. He travels at a speed of 21 km/h for the first half of the journey and at a speed of 24 km/h for the second half. Calculate the total distance travelled (in kilometres).

SSC CHSL 25/05/2022 (Shift- 03)

(a) 212 (b) 224
(c) 235 (d) 230

40. A train travels for $5\frac{1}{2}$ hours, the first half of the distance at 60 km/h and the other half at 20 m/sec. The total distance (in km) travelled is:

SSC MTS 27/10/2021 (Shift-02)

(a) 360 (b) 250
(c) 300 (d) 240

41. A student goes to school at a speed of $5\frac{1}{2}$ km/h and returns at a speed of 4 km/h. If he takes $4\frac{3}{4}$ hours for the entire journey, then the total distance covered by the student (in km) is:

SSC CGL TIER - II 29/01/2022

(a) 11 (b) 22
(c) 16 (d) 24

42. A man travels some distance at a speed of 12 km/h and returns at a speed of 8 km/h. If the total time taken by him is 3 hours and 45 minutes, then the total distance (in km) travelled is.

SSC CPO 27/06/2024 (Shift-03)

(a) 32 (b) 42
(c) 36 (d) 24

◆ TYPE – IV ◆
WHEN DISTANCE IS CONSTANT AND DIFFERENCE OF TIME IS GIVEN

43. A boy covers a certain distance between his house and school on a cycle. Riding on an average speed of 15 km/h, he is late by 10 min. However, with an average speed of 20 km/h, he reaches the school 5 min earlier. Find the distance between his house and school.

SSC CHSL 02/08/2023 Shift-04

(a) 25 km (b) 20 km
(c) 15 km (d) 30 km

44. If Tanya walks at the speed of 6km/h, she misses a train by 2 minutes. However, if she walks at the speed of 8 km/h, she reaches the station 3 minutes before the arrival of the train. The distance covered by Tanya to reach the station is:

SSC CHSL 09/07/2024 (Shift-03)

(a) 3 km (b) 2.5 km
(c) 2.75 km (d) 2 km

45. A person reaches his destination 30 minutes late, if his speed is 3 km/h, and reaches 30 minutes before time if his speed is 4 km/h. Find the distance of his destination from his starting point.

SSC CHSL 10/07/2024 (Shift-01)

(a) 14 km (b) 11 km
(c) 12 km (d) 13 km

46. Ram walks at the speed of 12 km/hr and reaches his school 12 minutes late. If he walks at 16 km/hr, then he reaches 8 minutes before the scheduled time. What is the distance of his school from his house?

SSC MTS 11/05/2023 (Shift-01)

(a) 16 km (b) 30 km
(c) 20 km (d) 24 km

47. A person goes to his office by scooter at the speed of 80 km/hr and reaches 60 minutes earlier. If he goes at the speed of 50 km/hr then he reaches 48 minutes late. What will be the speed of the scooter to reach on the usual time?

SSC CHSL 21/03/2023 (Shift-02)

(a) 64 km/hr (b) 66 km/hr
(c) 60 km/hr (d) 62 km/hr

48. Ramesh drives from his home at a speed of 40 km/h and reaches his college 25 minutes late. The next day he increases his speed by 10 km/h, yet he is late by 10 minutes. How far is his college from his home?

SSC CHSL 24/05/2022 (Shift- 01)

(a) 50 km (b) 55 km
(c) 45 km (d) 60 km

49. If Raman drives his bike at a speed of 24 km/h, he reaches his office 5 minutes late. If he drives at a speed of 30 km/h, he reaches his office 4 minutes early. How much time (in minutes) will he take to reach his office at a speed of 27 km/h?

SSC CGL 20/04/2022 (Shift -02)

(a) 40 (b) 55
(c) 50 (d) 45

50. Punit goes from his home to his relative's place at a speed of 45 km/h. While returning from the relative's place, due to traffic, it takes him an hour longer as he can only drive at the speed of 40 km/h. Find the distance (in km) of his relative's place from his home.

SSC MTS 12/07/2022 (Shift-02)

(a) 400 (b) 720
(c) 180 (d) 360

51. A boy covers a certain distance between his house and school on a cycle. Having an average speed of 10 km/h, he is late by 10 min. However, with an average speed of 15 km/h, he reaches the school in 5 min, earlier. Find the distance (in km) between his house and school.

SSC MTS 08/09/2023 (Shift- 03

(a) 8 (b) 8.5
(c) 7.5 (d) 7

52. P and Q start from point A to point B, at the same time at speeds of 32 km/h and 40 km/h, respectively. If in covering the journey P takes 15 minutes longer than Q, the total distance AB of the journey is:

SSC MTS 04/09/2023 (Shift- 01)

(a) 36 km (b) 32 km
(c) 40 km (d) 44 km

53. Aman drove from home to a town at the speed of 60 km/hr and on his return journey, he drove at the speed of 30 km/hr and took an hour longer to reach home. What distance did he cover each way?

SSC CHSL 17/03/2023 (Shift-02)

(a) 75 km (b) 55 km
(c) 60 km (d) 80 km

54. In covering a distance of 50 km. Somya takes 1 hour more than Sunny. If Somya doubles his speed. then he would take 1 hour less than Sunny. Somya's speed is:

SSC MTS 17/05/2023 (Shift 03)

(a) 18.4 km/hr (b) 12.5 km/hr
(c) 14.8 km/hr (d) 15.6 km/hr

55. Amita travels from her house at $3\frac{1}{2}$ km/h and reaches her school 6 minutes late. The next day she travels at $4\frac{1}{2}$ km/h and reaches her school 10 minutes early. What is the distance between her house and the school?

SSC CGL TIER-II 16/11/2020 (Shift-01)

(a) 5.4 km (b) 5.6 km
(c) 4.8 km (d) 4.2 km

◆ TYPE – V ◆
AVERAGE SPEED

56. Shankar covers a certain distance by a car driving at 40 km/h and he returns to the starting point riding on a scooter with a speed of 20 km/h. Find the average speed of the whole journey.

SSC CHSL 04/07/2024 (Shift-01)

(a) $22\frac{2}{3}$ km / h (b) $24\frac{2}{3}$ km / h
(c) $29\frac{2}{3}$ km / h (d) $26\frac{2}{3}$ km / h

57. A man travels some distance from his house to the exhibition ground by an auto at a speed of 30 km/h and returns by a cab at a speed of 50 km/h. What is his average speed (in km/h)?

SSC CPO 29/06/2024 (Shift-03)

(a) 38 (b) 28
(c) 40 (d) 37.5

58. Rajinder drives his car at an average speed of 40 km per hour to cover half of his total distance and thereafter he increases his speed to 60 km per hour. He covers his journey in 7 hours. What is the average speed of Rajinder in this journey?

SSC CHSL 03/08/2023 (Shift-02)

(a) 52 km per hour
(b) 48 km per hour
(c) 50 km per hour
(d) 54 km per hour

59. A motorcyclist rides his motorcycle at a speed of 90 km/hr in the first one hour and the next two hours at a speed of 120 km/hr. Find the average speed of the rider.

SSC CHSL 05/07/2024 (Shift-03)

(a) 110 km/hr (b) 115 km/hr
(c) 105 km/hr (d) 120 km/hr

60. The distance between two stations A and B is 800 km. A train covers the journey from A to B at a speed of 90 km/h and returns to A with a uniform speed of 65 km/h. Find the average speed of train during the whole journey (in km/h).

SSC CPO 29/06/2024 (Shift-02)

(a) 82.36 (b) 80.50
(c) 70.45 (d) 75.48

61. The speed of a car going from A to B is 110 km/h. While coming back, its speed is 76 km/h. What is the average speed during the entire journey?

SSC CHSL 14/08/2023 (Shift-2)

(a) $87\frac{81}{99}$ km/h (b) $83\frac{89}{93}$ km/h
(c) $89\frac{83}{93}$ km/h (d) $82\frac{91}{97}$ km/h

62. A person goes to his office at one-fourth the speed at which he returns home from his office. If the average speed during the whole round (trip) is 15 km/hr, what would have been his speed while going to office?

SSC CGL 13/06/2019 (Shift-02)

(a) $\frac{75}{8}$ km/h (b) 9 km/h
(c) $\frac{17}{3}$ km/h (d) $\frac{15}{2}$ km/h

63. Ram travelled an equal distance with speed of 40 km/hr, 45 km/hr and 60 km/hr. What is the average speed of Ram during the whole journey? Correct to two decimal places.

SSC CHSL 01/07/2024 (Shift-02)

(a) 66.94 km/hr (b) 94.66 km/hr
(c) 64.96 km/hr (d) 46.96 km/hr

64. A person divides his total route of journey into three equal parts and decides to travel the three parts at the speeds of 80 km/h, 60 km/h and 30 km/h, respectively. What is the average speed during the journey?

SSC CHSL 05/07/2024 (Shift-04)

(a) 49 km/h (b) 40 km/h
(c) 48 km/h (d) 45 km/h

65. A man makes four trips of equal distances. His speed on first trip was 720 km/hr and in each subsequent trip his speed was half of the previous trip. What is the average speed of the man in these four trips ?

SSC CHSL 14/03/2023 (Shift-04)

(a) 104 km/hr (b) 156 km/hr
(c) 192 km/hr (d) 288 km/hr

66. P drives a car for 5 hours and after every hour he doubles the speed. In the fifth hour, his speed is 128 km/h. What is his average speed of the journey in km/h?

SSC Phase XII 21/06/2024 (Shift-02)

(a) 52.6 (b) 62.6
(c) 49.6 (d) 55.6

67. A cyclist rides 10 km at an average speed of 15 km/hr and then the next 15 km at an average speed of 10 km/hr. The average speed of the entire ride is:

SSC CHSL 10/07/2024 (Shift-01)

(a) 20 km/hr (b) 12.5 km/hr
(c) 10 km/hr (d) 11.54 km/hr

68. A motorcycle covered the first 60 km of its journey at an average speed of 40 km/h. The speed of the motorcycle for covering the rest of the journey, i.e. 90 km, was 45 km/h. During the whole journey, the overall average speed of the motorcycle was:

SSC CHSL 01/07/2024 (Shift-01)

(a) $42\frac{6}{7}$ km/h (b) 42 km/h
(c) $42\frac{1}{7}$ km/h (d) $42\frac{1}{2}$ km/h

69. A bus covers the first 50 km of its journey in 40 minutes and covers the remaining 75 km in 40 minutes. What is the average speed (in km/h) of the bus?

SSC CPO 27/06/2024 (Shift-02)

(a) $95\frac{1}{4}$ (b) $93\frac{3}{4}$
(c) $101\frac{1}{4}$ (d) $105\frac{3}{4}$

70. R reaches office from home in 30 minutes and comes back in 20 minutes. The distance to his office from home is 12.5 km. What is his average speed (in km/h) from home to office and then back home?

SSC CPO 27/06/2024 (Shift-03)

(a) 20 (b) 25
(c) 60 (d) 30

71. A travels for 8 hours at the rate of 4 km/h and for 4 hours at the rate of 8 km/h. The average speed of the journey (in km/h) is:

SSC CPO 28/06/2024 (Shift-03)

(a) $5\frac{2}{3}$ (b) $4\frac{2}{3}$
(c) $5\frac{1}{3}$ (d) $4\frac{1}{3}$

72. A truck travels 75 km in the first hour and 33 km in the second hour. Find the average speed of the truck (in km/h).

SSC Phase XII 20/06/2024 (Shift-03)

(a) 54 (b) 42
(c) 108 (d) 60

73. A bus covers the first 70 km of its journey in 40 minutes and the remaining 60 km in 30 minutes. The average speed of the bus, in km/h, is:

SSC Phase XII 20/06/2024 (Shift-02)

(a) $109\frac{3}{7}$ (b) $106\frac{5}{7}$
(c) $91\frac{2}{7}$ (d) $111\frac{3}{7}$

74. Sahil covers a distance of 96 km at the speed of 16 km/h and covers another distance at the speed of 21 km/h in 5 hours. What is his average speed (in km/h)? (Rounded off to 2 decimal places)

SSC Phase XII 20/06/2024 (Shift-02)

(a) 19.45 (b) 18.50
(c) 18.27 (d) 17.47

75. The total journey is 800 km. A car travels the first 320 km of the journey at the speed of 64 km/hr. What should be the speed of the next 480 km so that average speed will become 80 km/hr?

SSC MTS 05/09/2023 (Shift- 02)

(a) 89 km/hr (b) 96 km/hr
(c) 69 km/hr (d) 86 km/hr

76. Two-fifth of a journey is covered at a speed of 45 km/h, and the remaining distance is covered at the rate of 63 km/h. The average speed for the whole journey (in km/h, rounded off to the nearest integer) is:

SSC MTS 11/09/2023 (Shift- 03)

(a) 54 (b) 55
(c) 58 (d) 60

77. A person completes 80 km of a journey at 10 km/h and the remaining 70 km in 7 hours. His average speed for the whole journey is:

SSC Phase XI 28/06/2023 (Shift-01)

(a) 10.5 km/h (b) 9 km/h
(c) 10 km/h (d) 9.5 km/h

78. A car travels the first 180 km at a speed of 20 km/h. It covers the next 210 km at a speed of 35 km/h. Find the average speed of the car (in km/h).

SSC Phase XI 28/06/2023 (Shift-03)

(a) 15 (b) 55
(c) 27.5 (d) 26

79. In a 100-km journey, the average speed of S is 40 km/h. He covers the first 60 km in 40 minutes and the next 20 km in 50 minutes. What is his speed in the last 20 km (in km/h)?

SSC CPO 29/06/2024 (Shift-01)

(a) 20 (b) 40
(c) 25 (d) 30

80. The total distance in a journey is 750 km. A bus travel the first 200 km at a speed of 40 km/hr. Find the speed of the bus (km/hr) for the next 550 km such that the average speed of the bus is 50 kmph.

SSC CHSL 11/08/2023 (Shift-3)

(a) 55 (b) 60
(c) 45 (d) 40

81. Mithila covers 50 km by bus in 90 minutes. After deboarding the bus, she takes rest for 15 minutes and covers another 30 km by a taxi in 35 minutes. Find the average speed (in km/h) for the whole journey.

SSC CHSL 02/07/2024 (Shift-03)

(a) $31\frac{2}{7}$ (b) $32\frac{2}{7}$
(c) $34\frac{2}{7}$ (d) $33\frac{2}{7}$

82. A man travels 1200 km by train at 80 km/h, 1600 km by ship at 40 km/h, 1000 km by plane at 400 km/h, and 200 km by car at 50 km/h. What is the average speed for the entire distance? (rounded off to 2 decimal places)

SSC CPO 28/06/2024 (Shift-02)

(a) 75.40 km/h (b) 68.14 km/h
(c) 72.40km/h (d) 65.04 km/h

83. Ashish covers 72 km at a speed of 45 km/h by bike, 28 km at a speed of 4 km/h by bicycle, and another 160 km at a speed of 20 km/h by car. Find his average speed (in km/h) for the whole journey. (Rounded off to two decimal places)

SSC CPO 28/06/2024 (Shift-03)

(a) 15.66 (b) 25.25
(c) 28.33 (d) 27.65

84. If a man travels at $\frac{1}{x}$ km/h on a journey and returns at $\frac{1}{x^2}$ km/h, then his average speed for the journey is:

SSC CGL 02/12/2022 (Shift- 03)

(a) $\frac{x+1}{x^2}$ (b) $\frac{2}{x+x^2}$
(c) $\frac{1}{x+x^2}$ (d) $\frac{2x^2}{x+1}$

85. A car travels from P to Q at the speed of 45 km/h and from Q to R at 65 km/h . If the distance from P to Q is 60 km and the distance from Q to R is 100 km, what is the average speed of the car during the whole journey (corrected to two decimal places)?

SSC Phase-X 04/08/2022 (Shift- 03)

(a) 55.71 km/h (b) 60.31 km/h
(c) 54.71 km/h (d) 61.31 km/h

86. A person covers 11 km with a speed of 7 km/h, 25 km with a speed of 10 km/h and 30 km with a speed of 20 km/h. What is the average speed of the person?

SSC CPO 28/06/2024 (Shift-02)

(a) $11\frac{7}{13}$ km/h (b) $11\frac{11}{13}$ km/h
(c) $11\frac{10}{13}$ km/h (d) $11\frac{9}{13}$ km/h

87. A person drives 110 miles at 55 miles per hour, he drives the next 120 miles at 60 miles per hour, and then he drives the next 60 miles in an hour. What is his average speed for the entire journey in miles per hour ?

SSC CHSL 01/07/2024 (Shift-02)

(a) 63 (b) 58
(c) 55 (d) 60

88. A bus travels $\frac{1}{3}$ of the distance initially at a speed of 40 km/h, the next $\frac{1}{3}$ of the distance 50 km/h, and the final $\frac{1}{3}$ of the distance at 60 km/h. Find the average speed of the bus for the entire journey. (Rounded off to two decimal places)

SSC CGL 10/09/2024 (Shift-01)

(a) 48.65 km/h. (b) 51.43 km/h.
(c) 54.13 km/h. (d) 46.85 km/h.

89. Mohan completed a certain journey by car. If he covered 30% of the distance at 90 km/h, 45% of the distance at 135 km/h and the remaining distance at 75 km/h. His average speed (in km/h) for the entire journey is:

SSC CHSL 03/08/2023 (Shift-02)

(a) 100 (b) 90
(c) 105 (d) 95

90. A car covers 20 km in the first quarter of an hour, 25 km in the second quarter of that hour and 15 km in the third quarter. The average speed of the car (in km/h) over the entire journey is:

SSC CPO 27/06/2024 (Shift-01)

(a) 70 km/h (b) 75 km/h
(c) 80 km/h (d) 65 km/h

91. A person covers $\frac{1}{4}$ of his journey at the speed of 25 km/h, $\frac{1}{2}$ of the journey at 40km/h and the remaining at the speed of 50 km/h. Find his average speed per hour for the whole journey (in km/h).

SSC CHSL TIER-II 02/11/2023

(a) $36\frac{4}{11}$ (b) $34\frac{6}{11}$
(c) $36\frac{6}{11}$ (d) $34\frac{6}{11}$

92. Two-thirds of a certain distance was covered at the speed of 15 km/h, one-fifth at the speed of 25 km/h and the rest at the speed of 50 km/h. Find the average speed (in km/h) for the whole journey (rounded off to two decimal places).

SSC Phase XI 28/06/2023 (Shift-02)

(a) 22.65 (b) 25.25
(c) 18.15 (d) 20.25

93. Medha covers 81 km at a speed of 27 km/h by bike, 12 km at a speed of 6 km/h by bicycle, and another 270 km at a speed of 45 km/h by car. Find her average speed for the whole journey.

SSC Phase XI 28/06/2023 (Shift-04)

(a) 33 km/h (b) 36 km/h
(c) 34 km/h (d) 35 km/h

94. A man covers half part of a certain distance at 35 km/hr. He covers 40 percent of remaining distance at the speed of 8 km/hr and covers rest of the distance at the speed of 18 km/hr. What is his average speed for the entire journey?

SSC MTS 14/06/2023 (Shift-01)

(a) $\frac{920}{47}$ km/hr (b) $\frac{480}{47}$ km/hr
(c) $\frac{840}{47}$ km/hr (d) $\frac{760}{47}$ km/hr

95. One third part of a certain journey is covered at the speed of 10 km/hr, one fourth part at the speed of 15 km/hr and the rest part at the speed of 20 km/hr. What will be the average speed for the whole journey?

SSC CHSL 16/03/2023 (Shift-01)

(a) 15 km/hr (b) $\frac{200}{17}$ km/hr
(c) $\frac{240}{17}$ km/hr (d) $\frac{280}{17}$ km/hr

96. Reshma travels 45 km at 15 km/h by cycle, 80 km at 40 km/h by car and the remaining 6 km by foot at 2 km/h. Find his average speed for the whole journey. (Rounded off to 2 decimal places)

SSC CGL TIER-II 06/03/2023

(a) 15.25 km/h (b) 16.38 km/h
(c) 18.36 km/h (d) 43.50 km/h

97. A person travels by a car at 40 km/h for 3 hours, by a bike at 30 km/h for 2 hours, and by a train at 80 km/h for 5 hours. What is the average speed at which he travelled?

SSC CGL 09/12/2022 (Shift- 02)

(a) 56 km/h (b) 60 km/h
(c) 62 km/h (d) 58 km/h

98. A car travels with a speed of 21 m/sec in the first 10 minutes, 9 km in the next 10 minutes and 10 km in the last 10 minutes of its journey. What is the average speed of the car (in km/h) during its entire journey?

SSC CPO 10/11/2022 (Shift-01)

(a) 60 km/h (b) 63.2 km/h
(c) 62 km/h (d) 65.3 km/h

99. Two-thirds of a certain distance was covered at the speed of 45 km/h, one-fourth at the speed of 60 km/h and the rest at the speed of 75 km/h. Find the average speed per hour for the whole journey. (correct to 2 decimal places)

SSC CGL 01/12/2022 (Shift- 04)

(a) 51.25 km/h (b) 45.75 km/h
(c) 58.25 km/h (d) 49.77 km/h

100. In a journey of three unequal laps, a car covers a distance of 200 km in 4 h in the first lap, while another 162 km at the speed of 15 m/s in the second lap. It covered the remaining distance of the final lap in 4 h such that the average speed of the car for entire journey was 50 km/h. What was the speed of the car in the third lap of the journey?

SSC CPO 10/11/2022 (Shift-02)

(a) 47 km/h (b) 52 km/h
(c) 42 km/h (d) 45 km/h

101. While travelling from A to B, Raghav travels a quarter of the distance at 10 km/h, the next quarter of the distance at 15 km/h, the third quarter of the distance at 20 km/h, and the final quarter of the distance at 30 km/h. While travelling on exactly the same route, Manish travels for a quarter of the total time taken for his journey at 10 km/h, the next quarter of the total time taken for his journey at 15 km/h, the third quarter of the total time taken for his journey at 20 km/h, and the final quarter of the total time taken for his journey at 30 km/h. If the overall average speed of Raghav during his journey is given as y km/h, and that of Manish is given as z km/h, find the value of (z – y).

SSC Phase XII 21/06/2024 (Shift-03)

(a) 2.5 (b) 2.75
(c) 0 (d) 1.5

102. A man runs for 40 km. The time taken by him in the first 10 km is twice the time taken by him in the second 10 km. The time taken in the third 10 km is half of the time taken in the fourth 10 km, and the time taken in the fourth 10 km is equal to the time taken in the first 10 km. If his speed in the first 10 km is 40 km/h, then what is the average speed for 40 km?

SSC CPO 03/10/2023 (Shift-01)

(a) $\frac{160}{3}$ km/h (b) $\frac{70}{3}$ km/h
(c) 50 km/h (d) 40 km/h

103. A car, during its entire journey of 5 hours, travels the first 45 minutes at a certain speed, the next 75 minutes at a speed of 85 km/h, and the last 3 hours at a speed of 70 km/h. During its entire journey, the average speed of the car is found to be 73 km/h. What is the speed (in km/h) of the car during the first 45 minutes?

SSC CPO 04/10/2023 (Shift-02)

(a) 62 (b) 65

(c) 72 (d) 68

104. Some students went on a field trip. At a speed of 6 km/h, they travelled by bikes for 2 hours; then at a speed of 2 km/h, they walked for another hour; then they took rest for an hour and had lunch for half an hour; then at a speed of 1 m/s, they walked for an hour to visit a garden; and finally at a speed 4 km/h, they returned home in 3 hours. Their average speed, in km/h, (rounded off to two places of decimal) is:

SSC CGL 12/12/2022 (Shift-03)

(a) 3.48 (b) 129.23

(c) 0.28 (d) 251.62

105. A bus during its journey travels 60 min at a speed of 80 km/h, another 90 min at a speed of 100 km/h and 4 hours at a certain speed. If the average speed of the bus during its whole journey is 70 km/h, what is the speed of the bus during the 4 hours?

SSC Phase-X 04/08/2022 (Shift- 02)

(a) 56.25 km/h (b) 67.75 km/h

(c) 62.35 km/h (d) 70.00 km/h

106. The ratio of the distance between two places A and B to the distance between places B and C is 3 : 5. A man travels from A to B at a speed of x km/h and from B to C at a speed of 50 km/h. If his average speed for the entire journey is 40 km/h, then what is the value of $(x - 10) : (x + 1)$?

SSC CGL TIER-II 29/01/2022

(a) 20 : 31 (b) 31 : 20

(c) 11 : 10 (d) 10 : 11

107. P and Q are two towns. A man drives from P to Q at an average speed of 50 km/h. He stops at Q for 4 hours and then heads back to P at an average speed of 40 km/h following the same route. What is his average speed (in km/h correct to two decimal places) if he takes 22 hours for the entire trip?

SSC MTS 18/10/2021 (Shift-02)

(a) 48.48 (b) 45.00

(c) 36.36 (d) 42.42

108. S drives his car and covers 37 km and 500 m in 90 minutes. What is his average speed (in km/h)?

SSC CPO 28/06/2024 (Shift-01)

(a) 25 (b) 22.5

(c) 40 (d) 20

109. A bus covers 1200 km in 30 hours. What is its average speed in m/s?

SSC Phase XII 20/06/2024 (Shift-02)

(a) $11\frac{1}{9}$ (b) $12\frac{1}{3}$

(c) $12\frac{1}{9}$ (d) $13\frac{1}{9}$

110. A girl cycles from A to B, a distance of 25 km in 2 hours 20 minutes. The road from A is a levelled road for 15 km and then it slopes down to B. The average speed of the girl on the levelled road is 10 km/h. Her average downhill speed (in km/h) is:

SSC MTS 18/10/2021 (Shift-02)

(a) 18 (b) 12

(c) 15 (d) 10

111. A man cycles from P to Q, a distance of 30km, in 2 hours 48 minutes. The road from P is a level road for 18km. and then it is uphill to Q. The man's average speed on the level road is 15km/h. What is his average uphill speed (in km/h)?

SSC CHSL 16/04/2021 (Shift-01)

(a) 10.5 (b) 12

(c) 9 (d) 7.5

112. A bus driver must complete a 240 km trip in 4 hours. If he averages 70 km an hour for the first 3 hours of his trip, how fast must he travel (in km/h) in the last/final hour?

SSC CHSL 03/07/2024 (Shift-01)

(a) 60 (b) 35

(c) 30 (d) 50

113. A student goes to his school by cycle. The distance from his house to school is 5 km and he covers this distance in 1 hour. While going he stops twice for 5 minutes each. Find his average speed (in km/h).

SSC CPO 29/06/2024 (Shift-03)

(a) 5.5 (b) 6.5

(c) 6 (d) 4.5

114. A man covers a certain distance by bike. If he covers 25% of the distance at the speed of 25 km/h, 50% of the distance at the speed of 50 km/h and the remaining distance at the speed of 12.5 km/h, find his average speed over the whole journey.

SSC CPO 05/10/2023 (Shift-3)

(a) 25 km/h (b) 30 km/h

(c) 35 km/h (d) 20 km/h

115. A man drives his car at a speed of 50 km/hr for 2 hours and then decides to slow down to 40 km/hr till the end of the journey. If his average speed for the journey was 44 km/hr, then for how much time he drives his car at speed of 40 km/hr?

SSC MTS 19/05/2023 (Shift-02)

(a) 2 hours (b) 1 hour

(c) 3 hours (d) 4 hours

◆ TYPE – VI ◆
AVERAGE SPEED WITH STOPPAGE

116. The speed of a train including stoppages is 75 kmph and excluding stoppages, the speed of the train is 90 kmph. For how many minutes does the train stop per hour?

SSC CHSL 13/03/2023 (Shift-03)

(a) 10 min (b) 15 min

(c) 20 min (d) 11 min

117. Excluding stoppages, the speed of a bus is 60 kmph and including stoppages, it is 54 kmph. For how many minutes does the bus stop per hour?

SSC CHSL 20/03/2023 (Shift-03)

(a) 4 mins (b) 6 mins

(c) 7 mins (d) 5 mins

118. The speed of a bus without stoppages is 40 km/h and with stoppages is 32 km/h. How many minutes per hour does the bus stop?

SSC MTS 08/10/2021 (Shift-02)

(a) 18 (b) 15

(c) 12 (d) 16

119. A train without stoppage travels with an average speed of 65 km/ hr and with stoppage, it travels with an average speed of 52 km/ hr. For how many minutes does the train stop on an average per hour?

SSC CGL 11/06/2019 (Shift-01)

(a) 13 (b) 15

(c) 12 (d) 14

120. A man walks at a speed of 8 km/h. After every kilometre, he takes a rest for 4 minutes. How much time will he take to cover a distance of 6 km?

SSC CGL TIER-II 18/11/2020 (Shift-01)

(a) 69 min (b) 60 min

(c) 65 min (d) 70 min

◆ TYPE – VII ◆
RADHA CONCEPT

121. A and B started their journeys from X to Y and Y to X, respectively. After crossing each other, A and B completed remaining parts of their journeys in $6\frac{1}{8}$ hours and 8 hours, respectively. If the speed of A is 32 km/h, then the speed (in km/h) of B is:

SSC CGL 12/04/2022 (Shift - 02)

(a) 21 (b) 28

(c) 30 (d) 25

122. Suman travels from place X to Y and Rekha travels from Y to X, simultaneously. After meeting on the way, Suman and Rekha reach Y and X, in 3 hours 12 minutes and 1 hour 48 minutes, respectively. If the speed of Rekha is 9 km/h. then the speed (in km/h) of Suman is:

SSC CGL 18/08/2021(Shift 02)

(a) $7\frac{1}{2}$ (b) 6

(c) 8 (d) $6\frac{3}{4}$

123. A and B start moving towards each other from places X and Y, respectively, at the same time on the same day. The speed of A is 20% more than that of B. After meeting on the way, A and B take p hours and $7\frac{1}{5}$ hours, respectively, to reach Y and X, respectively. What is the value of p?

SSC CGL 13/11/2020 (Shift-01)

(a) 5 (b) 5.5
(c) 6 (d) 4.5

124. A and B are travelling towards each other from the points P and Q respectively. After crossing each other, A and B take $6\frac{1}{8}$ hours and 8 hours respectively, to reach their destinations Q and P respectively. If the speed of B is 16.8 km/hr, then the speed (in km/hr) of A is:

SSC CGL 06/06/2019 (Shift-01)

(a) 20.8 (b) 19.8
(c) 19.2 (d) 20.4

125. Two trains, A and B started travelling towards each other at the same time, from places P to Q and Q to P, respectively. After crossing each other, A and B took 9 hours and 16 hours to reach Q and P, respectively. If the speed of A was 56 km/h, then what was the speed (in km/h) of B?

SSC Phase XII 21/06/2024 (Shift-01)

(a) 38 (b) 42
(c) 40 (d) 46

• TYPE – VIII •
BASED ON POLICE AND THIEF

126. A thief noticed a policeman at a distance of 600 metres. The thief started running and the policeman chased him. The thief and policeman are running at speeds of 12 km/h and 15 km/h, respectively. Find the time (in minutes) required for the policeman to catch the thief.

SSC CGL 09/09/2024 (Shift-03)

(a) 8 (b) 10
(c) 12 (d) 15

127. A thief is noticed by a policeman from a distance of 200 m. The thief starts running and the policeman chases him. The thief and the policeman run at the rate of 10 km/h and 11 km/h, respectively. What is the distance (in metres) between them after 9 minutes?

SSC CGL 11/09/2024 (Shift-02)

(a) 40 (b) 50
(c) 30 (d) 60

128. A thief pursued by a policeman was 150 m ahead at the start. If the ratio of the speed of the policeman to that of the thief was 5 : 4, then how far (distance in metres) could the thief go before he is caught by the policeman?

SSC CGL 12/09/2024 (Shift-02)

(a) 350 (b) 200
(c) 600 (d) 400

129. A thief is spotted by a policeman from a distance of 200 metres. When the policeman starts the chase, the thief also starts running. If the speed of the thief is 9 km/h and that of the policeman 10 km/h, how far will the thief have to run before he is overtaken?

SSC CGL 19/09/2024 (Shift-02)

(a) 1.2 km. (b) 1.4 km.
(c) 1.8 km. (d) 1.6 km.

130. A thief is spotted by a policeman from a distance of 195 metres. When the policeman starts the chase, the thief also starts running. If the speed of the thief is 22 km/h and that of the policeman is 27 km/h, then how far would the thief have run (in m) before he is overtaken?

SSC CGL 19/09/2024 (Shift-03)

(a) 825 (b) 951
(c) 858 (d) 958

131. A thief is noticed by a policeman from a distance of 92 m. The thief starts running and the policeman chases him, The thief and the policeman run at the speed of 90 km/h and 104.4 km/h, respectively. In how much time will the policeman catch the thief?

SSC CGL 23/09/2024 (Shift-01)

(a) 21 seconds (b) 26 seconds
(c) 23 seconds (d) 22 seconds

132. A thief is spotted by a policeman from a distance of 100 m. The thief starts running and the policeman chases him. If the speed of thief and policeman are 21 km/h and 23 km/h, respectively, then how far will the thief have to run before he is over taken?

SSC CGL 24/09/2024 (Shift-01)

(a) 1020 m (b) 1050 m
(c) 1090 m (d) 1080 m

133. A policeman is chasing a thief at a speed of 82 km/h. The thief is 1300 m away and is running at a speed of 64 km/h. In how much time will the policeman catch the thief if both are riding on bikes?

SSC CGL 24/09/2024 (Shift-03)

(a) 350 sec. (b) 260 sec.
(c) 250 sec. (d) 300 sec.

134. A policeman noticed a thief at some distance. The policeman started running to catch the thief and the thief also started running at the same time. The speed of both policeman and the thief was 12 km/hour and 10 km/hour, respectively. It took 30 minutes for the policeman to catch the thief. Find the initial distance (in metres) between them.

SSC CGL 25/09/2024 (Shift-02)

(a) 500 (b) 600
(c) 1000 (d) 100

135. A thief takes off on his bike at a certain speed, after seeing a police car at a distance of 250 m. The police car starts chasing the thief and catches him. If the thief runs 1.5 km before being caught and the speed of the police car is 70 km/h, then what is the speed of thief's bike (in km/h)?

SSC CGL 26/09/2024 (Shift-02)

(a) 65 (b) 60
(c) 55 (d) 50

136. The speed of a thief is $\frac{4}{5}$ times of the speed of a policeman. The thief covers a distance of 6 km before he was caught by the policeman in 30 minutes. Initially, what was the distance between the policeman and the thief in km?

SSC CHSL 09/07/2024 (Shift-04)

(a) 0.8 (b) 1.0
(c) 1.5 (d) 1.2

137. A policeman received information that a thief is at a distance of 1.5 km from him. The thief starts moving by car and the policeman chases him by car. The thief and the policeman are moving at the speeds of 90 km/h and 120 km/h respectively. At what distance (in km) will the police catch the thief ?

SSC CHSL 02/07/2024 (Shift-03)

(a) 45.0 km (b) 5 km
(c) 6 km (d) 4.5 km

138. A policeman was asked to chase a thief. Before the policeman started the chase, he realised that the thief was 200 metres ahead of him and was running at a speed of 16 km/h. The policeman started the chase at a speed of 20 km/h. How far will the thief run before he is overtaken by the policeman?

SSC CHSL 10/07/2024 (Shift-02)

(a) 1000 m (b) 700 m
(c) 800 m (d) 600 m

139. A policeman is chasing a thief at a speed of 12 km/h, and the thief is running at a speed of 8 km/h. If the policeman started 30 minutes late, find the time taken by the policeman to catch the thief.

SSC CHSL 08/07/2024 (Shift-01)

(a) 120 minutes (b) 60 minutes
(c) 90 minutes (d) 100 minutes

140. A police travelling at 65 km/h is chasing a thief who is 1200 m away from him and is travelling at 41 km/h. Find the time taken by the policeman to catch the thief.

SSC CHSL 11/07/2024 (Shift-01)

(a) 1 min (b) 2 min
(c) 3 min (d) 4 min

141. A policeman starts chasing a thief who is 500 m ahead of him. The speed of the thief is 18 km/h, and the speed of the policeman is 36 km/h. Find the time taken by the policeman to catch the thief.

SSC CHSL 03/07/2024 (Shift-02)

(a) 300 seconds (b) 100 seconds
(c) 150 seconds (d) 250 seconds

142. A thief running at 7 km/h is chased by a policeman whose speed is 12 km/h. If the thief is 280 m ahead of the policeman, then the time required for the policeman to catch the thief will be:

SSC CPO 27/06/2024 (Shift-01)

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(a) $3\frac{9}{25}$ min. (b) $3\frac{1}{25}$ min.

(c) $4\frac{9}{25}$ min. (d) $3\frac{2}{25}$ min.

143. A thief steals an item and escapes, running at 13.5 km/h. A policeman arrives at the spot of the crime after 8 minutes and immediately starts chasing the thief. 28 minutes after the policeman started to chase the thief, there is still a gap of 540 m between the two. At what distance from the spot of the crime would the policeman catch up with the thief, and what is the speed (in km/h) at which the policeman ran?

SSC Phase XII 26/06/2024 (Shift-03)

(a) 10.4 km, 16 (b) 10.8 km, 16.2
(c) 12.96 km, 16.2 (d) 11.2 km, 16.4

144. A thief is noticed by a policeman from a distance of 300 m. The thief starts running and the policeman starts chasing him. The thief and policeman run at the rate of 11 km/h and 13 km/h, respectively. After running for how many kilometres will the policeman be able to catch the thief?

SSC CPO 03/10/2023 (Shift-02)

(a) 1.85 (b) 1.75
(c) 1.65 (d) 1.95

145. An inspector is 288 metres behind a thief. The inspector runs 42 metres and the thief runs 30 metres in a minute. In how much time will the inspector catch the thief?

SSC CPO 04/10/2023 (Shift-01)

(a) 20 minutes (b) 24 minutes
(c) 19 minutes (d) 21 minutes

146. A policeman chases a thief who is 630 metres ahead of him. If they run at a speed of 9.5 km/hr and 6.5 km/hr, respectively, then what distance (in km, rounded off to 1 decimal place) does the thief run before he is nabbed by the policeman?

SSC MTS 01/09/2023 (Shift- 02)

(a) 1.4 (b) 2.0
(c) 1.2 (d) 1.8

147. A thief is noticed by a policeman from a distance of 98 m. The thief starts running and the policeman chases him. The thief and policeman run at the speed of 90 km/h and 118.8 km/h, respectively. What is the time taken to catch the thief by a policeman?

SSC MTS 06/09/2023 (Shift- 03)

(a) $10\frac{1}{2}$ sec (b) $13\frac{1}{4}$ sec

(c) $12\frac{1}{4}$ sec (d) $14\frac{1}{4}$ sec

148. A thief noticed a policeman at a distance of 500 m away from him. The thief starts running at a speed of 60 km/h and the policeman chased him running at a speed of 70 km/h. Find the time taken by the policeman to catch the thief (in minutes).

SSC MTS 11/09/2023 (Shift- 03)

(a) 3 (b) 10
(c) 6 (d) 15

149. A policeman follows a thief, who is 1250 m ahead of him. The policeman and the thief run at the speed of 10 km/h and 8 km/h, respectively. The distance (in km) run by the thief before he is nabbed by the policeman is:

SSC CGL 14/07/2023 (Shift- 4)

(a) 7 (b) 4
(c) 5 (d) 6

150. A thief is spotted by a constable from 200 m. When the constable starts the chase, the thief also starts running. If the speed of the constable is 8 km/h and thief runs at the speed of 6 km/h, then how far (in m) will the thief be able to run before he is overtaken?

SSC CGL 17/07/2023 (Shift-02)

(a) 600 (b) 400
(c) 550 (d) 500

151. A thief is spotted by a policeman from a distance of 400m. When the policeman starts chasing, the thief also starts running. If the speed of the thief is 32 km/h and that of the policeman is 40 km/h, then how far would the thief have run before he is overtaken?

SSC CGL 18/07/2023 (Shift-01)

(a) 1500 m (b) 1000 m
(c) 1200 m (d) 1600 m

152. A thief is spotted by a policeman from a distance of 210 m. When the policeman starts the chase, the thief also starts running. If the speed of the thief is 25 km/h and that of the policeman is 32 km/h, then how far would the thief have run (in m) before he is overtaken?

SSC CGL 18/07/2023 (Shift-04)

(a) 920 (b) 480
(c) 1200 (d) 750

153. A policeman chasing a thief is 0.5 km behind the thief. The speed of thief is 80% of the speed of the policeman and policeman catches him in 12 minutes. What is the speed of the thief (in km/h)?

SSC CGL 21/07/2023 (Shift-02)

(a) 10 (b) 12.5
(c) 15 (d) 7.5

154. A thief seeing a policeman from a distance of 400 m started running at a speed of 16 km/h. The policeman chased him immediately with a speed of 18 km/h and the thief was caught. What is the distance run by the thief before he was caught by the policeman?

SSC CGL 25/07/2023 (Shift-01)

(a) 3200 m (b) 3230 m
(c) 3240 m (d) 3220 m

155. A policeman spots a thief at a distance of 360 m. Both the policeman and the thief simultaneously start running, with the former chasing the latter. While the thief runs at the speed of 8 km/h, the policeman runs at 9.2 km/h. How many metres will the policeman have to run before he catches up with the thief?

SSC CGL 26/07/2023 (Shift-02)

(a) 2852 (b) 2714
(c) 2668 (d) 2760

156. A policeman follows a thief, who is 1 km ahead of him. The thief and the policeman run at speeds of 8 km/h and 10.5 km/h, respectively. What distance (in km) is run by the thief before he is nabbed by the policeman?

SSC Phase XI 28/06/2023 (Shift-02)

(a) 4.4 (b) 3.2
(c) 3.6 (d) 2.5

157. A policeman saw a thief from a distance of 450 m. When the policeman started chasing him, the thief also started running. The ratio of speeds of the thief to the policeman is 7 : 8. After running how much distance (in km) can the policeman catch the thief?

SSC CGL 05/12/2022 (Shift- 01)

(a) 3.75 (b) 3.4
(c) 3.15 (d) 3.6

158. A thief running at speed of 'x' km/h is chased by a policeman running at a speed of 10 km/h. If the thief is ahead by 100 metres, the policeman catches the thief after 3 minutes. At what speed is the thief running ('x' being the unknown speed)?

SSC CGL 09/12/2022 (Shift- 03)

(a) 4 km/h (b) 8 km/h
(c) 10 km/h (d) 6 km/h

159. A policeman sees a thief at a distance of 150 m. He starts chasing the thief who is running at a speed of 5 m/sec, while the policeman chases with a speed of 7m/sec. Find the distance covered by the thief when he is caught by the policeman.

SSC CPO 09/11/2022 (Shift-02)

(a) 285 m (b) 325 m
(c) 375 m (d) 295 m

160. Ram and Shyam start walking from the same place in the opposite direction. If Shyam walks at a speed of $5\frac{1}{4}$ km/hr and Ram at a speed of 3 km/hr, then after how much time will they be 44 km apart?

SSC CHSL 03/07/2024 (Shift-04)

(a) 3 hours 20 minutes
(b) 5 hours 20 minutes
(c) 6 hours 20 minutes
(d) 4 hours 20 minutes

161. A policeman notices a thief from a distance of 300 m. The thief starts running and the policeman chases him. The thief and the policeman run at the speeds of 10 km/h and 12 km/h, respectively. What will be the distance between them (in m) after 6 minutes?

SSC Phase XII 25/06/2024 (Shift-03)

(a) 150 (b) 100
(c) 200 (d) 80

162. A policeman noticed a thief from 300 m. The thief started running and the policeman was chasing him. The thief and the policeman ran at the speeds of 8 km/h and 9 km/h, respectively. What was the distance between them after 3 minutes?

SSC CGL 17/07/2023 (Shift-01)

(a) 225 m (b) 250 m
(c) 300 m (d) 200 m

163. A thief is noticed by a policeman from a distance of 200 m. The thief starts running as soon as he is noticed, and the policeman chases him simultaneously. The thief and the policeman run at the speeds of 10 km/h and 11 km/h, respectively. What is the distance (in m) between them after 6 min policeman starts chasing?

SSC CGL 20/07/2023 (Shift-03)

(a) 75 (b) 100
(c) 125 (d) 150

164. A thief was noticed by a policeman from a distance of 80 metres. The speed of the thief is 21 km/h and the policeman is 20 km/h. What is the distance between them after 18 seconds?

SSC Phase X-01/08/2022 (Shift- 03)

(a) 70 metres (b) 95 metres
(c) 90 metres (d) 85 metres

165. A thief steals an item and escapes, running at a speed of 15 km/h. A policeman arrives at the spot of the crime after 4 minutes and immediately starts chasing the thief. 16 minutes after the policeman started to chase the thief; there is still a gap of 200 m between the two. At what distance from the spot of the crime will the policeman catch up the thief and what is the speed (in km/h) of the policeman?

SSC CGL 25/07/2023 (Shift-04)

(a) 5.5 km, 16.5 (b) 6 km, 18
(c) 6.5 km, 19.5 (d) 4.5 km, 15

166. A starts his cycle at a speed of 15 km/hr while B, after 6 hours starts his cycle at a speed of 25 km/hr to catch A. Time taken by B to catch A is in hours.

SSC CHSL 10/08/2023 (Shift-3)

(a) 9 (b) 8
(c) 10 (d) 6

167. A thief steals a van at 3:00 a.m. and drives it at a speed of 57 km/h. The theft is discovered at 4:00 a.m. and the owner starts the chase with another van at a speed of 76 km/h. At what time will he catch the thief?

SSC CGL 14/07/2023 (Shift-02)

(a) 7:30 a.m. (b) 7:00 p.m.
(c) 7:00 a.m. (d) 6:00 a.m.

168. A thief steals an item and escapes, running at 20 km/h. A policeman arrives at the spot of the crime after 6 minutes and immediately starts chasing the thief. 24 minutes after the policeman started to chase the thief, there is still a gap of 400 m between the two. At what distance from the spot of crime would the policeman catch up with the thief, and what is the speed at which the policeman ran?

SSC CGL 26/07/2023 (Shift-01)

(a) 15 km; 25 km/h
(b) 14.4 km; 24 km/h
(c) 10 km; 25 km/h
(d) 12 km; 24 km/h

169. A thief stole jewellery from a shop at 8:15 p.m. and left on a bike at a speed of 60 km/h. The police were informed at 8:30 p.m. If the police want to arrest the thief at 9:00 p.m., what should be the minimum speed of the police jeep?

SSC CGL 08/12/2022 (Shift- 04)

(a) 60 km/h (b) 75 km/h
(c) 80 km/h (d) 90 km/h

170. A thief escapes from a police station at 8:00 a.m. on a cycle at a speed of 50 km/h. A policeman starts chasing the thief on a motorbike at 9 : 30 a.m. at the speed of 65 km/h. At what distance from the police station will the policeman catch up with the thief?

SSC MTS 05/07/2022 (Shift-03)

(a) 335 km (b) 310 km
(c) 325 km (d) 300 km

171. A starts walking at 4 km/hr and after 4 hours, B starts cycling from the same point as that of A, in the same direction at 10 km/hr. After how much distance from the starting point will B catch up with A (Correct to two decimal places)?

SSC CGL 13/06/2019 (Shift-01)

(a) 24.67 km (b) 26.67 km
(c) 25.67 km (d) 23.67 km

172. Vivek starts moving at the speed of 70 km/hr at 8:00 a.m. Neeraj starts moving in the same direction after 4 hours of Vivek at the speed of 120 km/hr. Which of the following statement(s) is/are correct?

I. Neeraj and Vivek meet each other at 5:36 p.m.

II. Total distance covered by both Neeraj and Vivek till 4 p.m. is 1080 km.

SSC CHSL 10/03/2023 (Shift-03)

(a) Neither I nor II (b) Only II
(c) Both I and II (d) Only I

173. A robber steals a bag from a man at 5 p.m. and starts running at 10 km/h. A policeman is informed about the robbery at 5:12 p.m. and he chases him on a cycle at 15 km/h. At what time is the robber caught by the policeman?

SSC CHSL 0/07/2024 (Shift-05)

(a) 5:48 p.m. (b) 5:36 p.m.
(c) 5:12 p.m. (d) 5:40 p.m.

174. A police station, a bank and a safe house for the thief are in a straight line with a bank in between. The distance between the police station and the safe house is four times the distance between the bank and the safe house. After looting the bank at 9 : 15 A.M, the thief runs away. A policeman gets the information instantly and chases him at the speed of 16 km/h. The policeman catches the thief at the gate of the safe house in fifteen minutes. What is the distance between the bank and the police station?

SSC Phase XII 25/06/2024 (Shift-02)

(a) 4 km (b) 1 km
(c) 2 km (d) 3 km

175. A policeman follows a thief who is 600 m ahead of the policeman. If the policeman and the thief run at speeds of 10 km/h and 8 km/h, respectively, in how much time (in minutes), will the policeman catch the thief?

SSC CGL 18/07/2023 (Shift-02)

(a) 16 (b) 14
(c) 18 (d) 12

◆ TYPE – IX ◆
RELATIVE SPEED

176. Places A and B are 144 km apart. Two cars start simultaneously, one form A and the other from B. If they move in the same direction, they meet after 12 hours, but if they move towards each other they meet after $\frac{9}{8}$ hours. The speed (in km/h) of the car moving at a faster speed, is:

SSC CGL 04/03/2020 (Shift-01)

(a) 70 (b) 72
(c) 60 (d) 64

177. Two places A and B are 60 km apart from each other on a highway. A car starts from A and another car from B at the same time. If they move in the same direction, they meet each other in 6 hours. If they move in the opposite direction towards each other, they meet in 1 hour 30 minutes. Find the speeds of the cars (in km/h).

SSC MTS 12/09/2023 (Shift- 02)

(a) 15, 20 (b) 25, 20
(c) 15, 18 (d) 25, 15

178. Places A and B are 20 km apart on the highway. A car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in one hour. If they travelled towards each other, they met in 12 minutes. What are the speeds (in km/h) of two cars?

SSC CGL 10/09/2024 (Shift-02)

(a) 60, 40 (b) 52, 48
(c) 51, 49 (d) 55, 45

179. A train starts running at a uniform speed of 60 km/h from station P towards station Q. At the same time another train starts running from station Q towards station P. If the distance between the stations P and Q is 275 km and the trains meet in two and a half hours, then what is the speed of the train running towards station P in km/h?

SSC CHSL 04/08/2021 (Shift- 02)

(a) 50 (b) 40
(c) 44 (d) 48

180. Two tourist buses start from the same point and move along two roads at right angles at speeds of 48 km/h and 36 km/h, respectively. The distance between the buses after 15 seconds is ________.

SSC CGL 05/12/2022 (Shift- 04)

(a) 175m (b) 350m
(c) 250m (d) 150m

181. The distance between two places A and B is 140 km. Two cars x and y start simultaneously from A and B, respectively. If they move in the same direction, they meet after 7 hours. If they move towards each other, they meet after one hour. What is the speed (in km/h) of car y if its speed is more than that of car x?

SSC CGL TIER - II 03/02/2020

(a) 60 (b) 100
(c) 80 (d) 90

182. Places A and B are 45 km apart from each other. A car starts from place A and another car starts from place B at the same time. If they move in the same direction, they meet in $4\frac{1}{2}$ h and if they move towards each other, they meet in 27 minutes. What is the speed (in km/h) of the car which moves faster?

SSC CGL 24/08/2021 (Shift-02)

(a) 50 (b) 45
(c) 55 (d) 56

183. The driver of a car, which is travelling at a speed of 75 km/h, locates a bus 80 m ahead of him, travelling in the same direction. After 15 seconds, he finds that the bus is 40 m behind the car. What is the speed of the bus (in km/h)?

SSC CGL TIER - II 03/02/2022

(a) 44.2 (b) 42.5
(c) 47.5 (d) 46.2

184. On a straight road, a bus is 30 km ahead of a car travelling in the same direction. After 3 hours, the car is 60 km ahead of the bus. If the speed of the bus is 42 km/h, then find the speed of the car.

SSC CPO 09/11/2022 (Shift-01)

(a) 67 km/h (b) 72 km/h
(c) 65 km/h (d) 59 km/h

185. A car and a bus were travelling in the same direction. At 7:30 am. the car travelling at a speed of 72 km/h was 4.2 km behind the bus. At 8:15 a.m. the car was 15.8 km ahead of the bus. What is the ratio of the speed of the car to the speed of the bus?

SSC PHASE IX 2022

(a) 27 : 17 (b) 9 : 5
(c) 9 : 4 (d) 36 : 17

186. Two trains start from Delhi and Puna towards each other at 7 am with speeds of 85 km/h and 67 km/h, respectively. If they cross each other at 3.30 p.m., the distance between the stations is:

SSC CPO 09/11/2022 (Shift-02)

(a) 1245 km (b) 1292 km
(c) 1283 km (d) 1227 km

187. The distance between two stations, A and B, is 575 km. A train starts from station A at 3:00 p.m. and moves towards station 'B' at an average speed of 50 km/h. Another train starts from station 'B' at 3: 30p.m. and moves towards station 'A' at an average speed of 60 km/h. How far from station 'A' will the trains meet?

SSC CGL 09/03/2020 (Shift-03)

(a) 300 km (b) 275 km
(c) 225 km (d) 325 km

188. Two people A and B are at a distance of 220 km from each other at 10:30 AM. After 30 minutes, A starts moving towards B at the speed of 40 km/hr while at 12 P.M. B starts moving away from A at a speed of 30 km/hr. At what time will they meet on the next day?

SSC CHSL 17/03/2023 (Shift-04)

(a) 7 : 00 AM (b) 4 : 00 AM
(c) 5 : 30 AM (d) 6 : 00 AM

189. A and B leave from point M at the same time towards point N. B reaches N and starts towards M instantly. He meets A at point O (between M and N). The distance between M and N is 245 km. If the speeds of A and B are 26 km/h and 65 km/h, respectively, then what is the distance between O and N?

SSC MTS 05/07/2022 (Shift-03)

(a) 115 km (b) 105 km
(c) 95 km (d) 140 km

190. Akshara and Siddharth travel from point P to Q, a distance of 72 km at a rate of 8 km/h and 10 km/h, respectively. Siddharth reaches Q first and returns immediately and meets Akshara at R. Find the distance from P to R.

SSC CGL 17/09/2024 (Shift-01)

(a) 65 km (b) 63 km
(c) 64 km (d) 66 km

191. Menu and Daya travel from point A to B, a distance of 105 km, at speeds of 10 km/h and 25 km/h, respectively. Daya reaches point B first and returns immediately and meets Menu at point C. Find the distance from point A to point C.

SSC CGL 09/12/2022 (Shift- 02)

(a) 35 km (b) 60 km
(c) 45 km (d) 62 km

192. Two places B1 and B2 are 500 km apart from each other. Sonit and Robin start moving from B1 towards B2 at the same time. After reaching B2, they return back to B1. Speed of Sonit is 80 km/hr more than the Robin. If they meet after 6 hours, then which of the following statements is /are correct?

I. Distance covered by Sonit is 600 km.

II. Speed of Robin is $\frac{120}{3}$ km/hr.

SSC CHSL 10/03/2023 (Shift-04)

(a) Only I (b) Only II
(c) Neither I nor II (d) Both I and II

193. A and B are two stations 420 km apart. A train starts from A at 11 am and travels towards B at the speed of 70 kmph. Another train starts from B at 12 noon and travels towards A at the speed of 30 kmph. At what time do they meet?

SSC CHSL 11/07/2024 (Shift-02)

(a) 2 pm (b) 3.30 pm
(c) 3 pm (d) 1.30 pm

194. Vinay and Mahesh are 250 metres apart from each other. They are moving towards each other with the speed of 36 km/hr and 54 km/hr respectively. In how much time will they meet each other?

SSC CGL TIER-II 08/08/2022

(a) 10 sec. (b) 12 sec.
(c) 20 sec. (d) 15 sec.

195. A train leaves Hyderabad at 4:00 A.M. and reaches Vijayawada at 8:00 A.M. the same day. Another train leaves Vijayawada at 6:00 A.M. and reaches Hyderabad at 9:30 A.M the same day. At what time do the two trains cross each other?

SSC Phase XII 25/06/2024 (Shift-04)

(a) 6 : 45 A.M. (b) 7 : 45 A.M.
(c) 6 : 56 A.M. (d) 7 : 56 A.M.

196. Ram starts from point A at 8 a.m. and reaches point B at 2 p.m. on the same day. On the same day, Raju starts from point B at 8 a.m. and reaches point A at 6 p.m. on the same day. Both points A and B are separated by only a straight line track. At what time they both meet?

SSC CGL 12/12/2022 (Shift- 03)

(a) 11:45 a.m. (b) 9:42 a.m.
(c) 10:42 a.m. (d) 12:42 p.m.

197. Two stations A and B are 230 km apart on a straight line. One train starts from A at 4 am and travels towards B at 40 km/hr. Another train starts from B at 5 am and travels towards A at a speed of 55 km/hr. At what time will they meet?

SSC MTS 10/05/2023 (Shift-02)

(a) 10 a.m. (b) 7 a.m.
(c) 6 a.m. (d) 8 a.m.

198. Two stations are 120 km apart on a straight line. A train starts from station A at 8 a.m. and moves towards station B at 20 km/h and another train starts from station B at 9 a.m. and travels towards station A at a speed of 30 km/h. At what time will they meet?

SSC CPO 10/11/2022 (Shift-01)

(a) 10:30 am (b) 10:00 am
(c) 11:00 am (d) 11:30 am

199. Two trains whose lengths are 450 metres and 300 metres are moving towards each other at the speed of 162 km/hr and 108 km/hr respectively. If distance between trains is 300 metres, then in how much time, these trains will cross each other?

SSC CGL MAINS (08/08/2022)

(a) 35 sec. (b) 21 sec.
(c) 14 sec. (d) 28 sec.

200. Two cities P and Q are 181 km apart on a straight road. One man starts from P at 8 : 30 A.M. and travels toward Q at 30 km/h. If another man starts from Q at 8 : 54 A.M. and travels towards P at a speed of 35 km/h. then at what time will they meet?

SSC CHSL 11/08/2023 (Shift-1)

(a) 11 : 30 AM (b) 10 : 00 AM
(c) 10 : 30 AM (d) 11 : 00 AM

201. Suppose A starts walking at a speed of 8 km/h. After 8 hours B started travelling on a bicycle at a speed of 24 km/h. The distance from the starting B can catch A is:

SSC CGL 25/09/2024 (Shift-01)

(a) 64 km (b) 96 km
(c) 72 km (d) 88 km

202. Two stations T_1 and T_2 are 300 km apart. A car starts from station T_1 at 8 am and moves towards station T_2 at a speed of 45km/hr. and at 10 am another car starts from station T_2 towards T_1 at a speed of 60km/hr. Then the cars will meet at:

SSC CHSL 03/07/2024 (Shift-01)

(a) 10 : 00 am (b) 12 : 00 pm
(c) 1 : 00 pm (d) 11 : 00 am

203. Two towns P and Q are 275 km apart. A motorcycle rider starts from P towards Q at 10:00 a.m. at the speed of 25 km/h. Another rider starts from Q towards P at 12 noon on the same day at the speed of 20 km/h. At what time will they cross each other?

SSC CPO 28/06/2024 (Shift-02)

(a) 3:00 pm (b) 5:00 pm
(c) 1:15 pm (d) 4:30 pm

204. Two cities A and B are 135 km apart on a straight track. One car starts from A at 8 a.m. and travels towards B at 25 km/h. Another car starts from B at 9 a.m. and travels towards A at a speed of 30 km/h. At what time will they meet?

SSC CGL 09/12/2022 (Shift- 01)

(a) 11 a.m. (b) 10 a.m.
(c) 10:45 a.m. (d) 11:30 a.m.

205. Ajit Singh left from place P at 9.30 a.m. for place Q, and David Raj left place Q at 1.30 p.m. for place P. The distance between them is 416 km. If Ajit Singh's speed is 44 km/h and David Raj's speed is 52 km/h, then at what time will they meet each other?

SSC CHSL 11/08/2021 (Shift-02)

(a) 4:30 p.m. (b) 6:00 p.m.
(c) 4:00 p.m. (d) 5:00 p.m.

206. Veena and Karmesh were at different places in Delhi. They fixed a meeting point to meet to settle some issue. Veena started her journey at 8:00 a.m. from place A and reached place B at 4:00 p.m. and Karmesh started moving from place B 2 hours later than the time Veena started and could reach place A at 5:00 p.m. the same day, via the same route. At what time will Karmesh and Veena meet each other?

SSC Phase XII 21/06/2024 (Shift-02)

(a) 1:24 p.m. (b) 1:00 p.m.
(c) 12:48 p.m. (d) 1:46 p.m.

207. A runner starts running from a point at 5:00 am at the speed of 10 km/hr. Second runner starts from the same point at 8:00 am in the same direction with a speed of 15 km/hr. At what time of the day will the second runner will overtake the first runner?

SSC MTS 15/06/2023 (Shift-02)

(a) 2:00 pm (b) 12:30 pm
(c) 12:00 pm (d) 1:00 pm

208. A train leaves station A at 8 am and reaches station B at 12 noon. A car leaves station B at 8:30 am and reaches station A at the same time when the train reaches station B. At what time do they meet?

SSC CGL 16/08/2021 (Shift- 02)

(a) 9 : 38 am (b) 10 : 22 am
(c) 10 : 08 am (d) 9 : 52 am

209. Two trains start at the same time from stations P and Q and travel towards each other at the speeds of 75 km/h and 100 km/h, respectively. When they meet, it is found that one train has travelled 50 km more than the other. The distance (in km) between two stations is:

SSC Phase XII 25/06/2024 (Shift-01)

(a) 325 (b) 350
(c) 300 (d) 375

210. Julie and Soma start from the same point and walk in opposite directions. Julie walks 4 km/h faster than Soma. After 4 hours they are 40 km apart. How fast did each walk?

SSC CPO 05/10/2023 (Shift-02)

(a) Julie – 7 km/h; Soma – 3 km/h
(b) Julie – 8 km/h; Soma – 4 km/h
(c) Julie – 9 km/h; Soma – 5 km/h
(d) Julie – 10 km/h; Soma – 6 km/h

211. A dog takes 5 leaps for every 6 leaps of a hare, but 4 leaps of the dog are equal to 5 leaps of the hare. The ratio of the speed of dog and hare is?

SSC GD 13/01/2023 (Shift-02)

(a) 16 : 24 (b) 24 : 16
(c) 25 : 24 (d) 24 : 25

212. A is chasing B in the same interval of time. A jumps 8 times, while B jumps 6 times. But the distance covered by A in 7 jumps is the same as that of B in 5 jumps. The ratio between the speeds of A and B is ________.

SSC CGL 08/12/2022 (Shift- 01)

(a) 32 : 24 (b) 30 : 56
(c) 20 : 21 (d) 28 : 36

◆ TYPE – X ◆
MISCELLANEOUS QUESTIONS

213. A bus start from a bus stand after every 50 minutes in the same direction. Mohit is walking in opposite direction with a speed of 50 km/hr. If Mohit meets each bus in 10 minutes, then what is the speed of bus?

SSC CHSL 15/03/2023 (Shift-04)

(a) 14.5 km/hr (b) 15 km/hr
(c) 12.5 km/hr (d) 10.5 km/hr

214. Two guns are fired at 13 minutes interval. But the passenger in the train hears the sound of second gun after 12 minute 30 seconds of the first. If the speed of sound is 330 m/s then the speed of train was.

(a) $47\frac{13}{25}$ km/hr (b) $45\frac{13}{25}$ km/hr
(c) $42\frac{13}{25}$ km/hr (d) $44\frac{25}{13}$ km/hr

215. Travelling a distance of 1000 km, a train slowed down due to repairs of the tracks. Its average speed for the trip reduced by 75 km/h and the time of travel increased by 3 hours. The original duration of the travel is:

SSC CPO 04/10/2023 (Shift-02)

(a) 5 hours (b) 6 hours
(c) 6.5 hours (d) 5.5 hours

216. The distance between two places is 1200 km. To cover this distance, a person X takes 5 hours lesser than another person Y, whose average speed is 40 km/h lesser than that of X. The time taken by Y to complete the travel is:

SSC Phase XI 27/06/2023 (Shift-03)

(a) 16 hours (b) 14 hours
(c) 18 hours (d) 15 hours

217. A fast local of Mumbai takes 45 minutes less than a slow local for a journey of 150 km. If the speed of the fast local is 10 km/h more than that of the slow local, find the speed (in km/h) of the slow local train.

SSC CPO 05/10/2023 (Shift-03)

(a) 30 (b) 40
(c) 45 (d) 35

218. A car left 60 minutes early than the scheduled time but in order to reach its destination 280 km away in time, it has to slow its usual speed by 14 km/hr. What is the usual speed of the car?

SSC CHSL 09/03/2023 (Shift-03)

(a) 77 km/hr (b) 70 km/hr
(c) 66 km/hr (d) 63 km/hr

219. A journey of 180 km takes 6 hours more when the speed of a bike is reduced by 8 km/h. What is the original speed of the bike?

SSC Phase-X 03/08/2022 (Shift- 02)

(a) 25 km/h (b) 15 km/h
(c) 30 km/h (d) 20 km/h

220. A person travels a distance of 300 km and then returns to the starting point. The time taken by him for the outward journey is 5 hours more than the time taken for the return journey. If he returns at a speed of 10 km/h more than the speed of going, what is the average speed (in km/h) for the entire journey?

SSC CPO 23/11/2020 (Shift-02)

(a) 24 (b) 30
(c) 20 (d) 15

221. The speed of train A is 25 km/hr more than the speed of train B. A takes 4 hours less time to travel a distance of 300 km that what train B takes to travel 250 km. What is the speed (in km/ hr) of A ?

SSC CGL 10/06/2019 (Shift-01)

(a) 60 (b) 50
(c) 65 (d) 55

222. A covered a distance of 240 km at a certain speed. Had his speed been 8 km/h less, then the time taken would have been one hour more for covering the same distance. How much time (in hours) will he take to cover a distance of 480 km at his original speed?

SSC CGL TIER-II 29/01/2022

(a) 8 (b) 10
(c) 11 (d) 9

223. A part of the journey is covered in 22.5 minutes at a speed of 68 km/h and the remaining part in 12 minutes at a speed of 72 km/h. The total distance of the journey is (to the nearest integer):

SSC CHSL 09/07/2024 (Shift-02)

(a) 40 km (b) 38 km
(c) 42 km (d) 35 km

224. A car starts running at an initial speed of 60km/h, with its speed increasing every hour by 10km/h. How many hours will it take to cover a distance of 1210km?

SSC Phase XI 30/06/2023 (Shift-02)

(a) 12 (b) 8
(c) 10 (d) 11

225. A delivery boy started from his office at 10 a.m. to deliver an article. He ride his scooter at a speed of 32 km/h. He delivered the article and waited for 15 minutes to get the payment. After the payment was made, he reached his office at 11.25 a.m., travelling at a speed of 24 km/h. Find the total distance travelled by the boy.

SSC CGL TIER-II 18/11/2020 (Shift-01)

(a) 32 km (b) 35 km
(c) 40 km (d) 30 km

226. Rashi travelled a distance of 400 km at an average speed of 50 km/h. She covers the first half distance in the first lag in 2 hours, while she covers another lag at half the speed of that of the first lag in 1 hour. What is the speed (in km/h) of the remaining distance?

SSC Phase XII 21/06/2024 (Shift-02)

(a) 45 (b) 60
(c) 30 (d) 50

227. Smita is faster than Pihu. Smita and Pihu each walk 48 km. The sum of their speeds is 14 km/hr, and the sum of times taken by them is 28 hours. What is Smita's speed?

SSC MTS 14/09/2023 (Shift- 03)

(a) 12 km/hr (b) 8 km/hr
(c) 12.5 km/hr (d) 10 km/hr

228. Ram needs to reach the examination centre in 6 hours, the journey itself is 250 km. If Ram has covered $\frac{3}{5}$th of the distance in 3.5 hours then what is the speed required to reach the destination 30 minutes early than the required time?

SSC CHSL 10/03/2023 (Shift-02)

(a) 50 km/hr (b) 90 km/hr
(c) 40 km/hr (d) 60 km/hr

229. Diameter of wheel of a cycle is 7 cm. A cyclist takes 75 minutes to reach a destination at the speed of 36.3 km/hr. How many revolutions will the wheel make during the journey?

SSC CHSL 17/03/2023 (Shift-03)

(a) 196280 (b) 206250
(c) 216580 (d) 212520

230. A car starts from point A towards point B, travelling at the speed of 20 km/h. $1\frac{1}{2}$ hours later, another car starts from point A and travelling at the speed of 30 km/h and reaches $2\frac{1}{2}$ hours before the first car. Find the distance between A and B.

SSC CGL 03/12/2022 (Shift- 01)

(a) 300 km (b) 240 km
(c) 260 km (d) 280 km

231. R jogs at twice the speed of walking and runs at twice the speed of jogging. From his home to office, he covers half of the distance by walking and the rest by jogging. From his office to home, he covers half the distance jogging and the rest by running. What is his average speed (in km/h) in a complete round from his home to office and back home if the distance between his office and home is 10 km and he walks at the speed of 5 km/h?

SSC CGL 05/12/2022 (Shift- 01)

(a) $\frac{90}{8}$ (b) $\frac{60}{8}$
(c) $\frac{60}{9}$ (d) $\frac{80}{9}$

232. A person travels 5x distance at a speed of 5 km/h, x distance at a speed of 5 km/h, and 4x distance at a speed of 6 km/h and takes a total of 112 minutes. What is the total distance (in km) travelled by the person?

SSC CGL 13/04/2022 (Shift - 03)

(a) 9 (b) 12
(c) 8 (d) 10

233. Ram travelled from a place Z to P at an average speed of 130 km/h. He travelled the first 75% of the distance in two third of the time and the rest at an average speed of x km/h. The value of $\frac{x}{2}$ is:

SSC CGL 20/04/2022 (Shift - 01)

(a) 97.5 (b) 51
(c) 91.25 (d) 48.75

234. When a person travels at a speed of $8\frac{1}{3}$ m/sec, he will reach his destination on time. He covers $\frac{2}{3}$ of the journey in $\frac{5}{8}$ of the time. At what speed (in km/h) should he travel to cover the remaining distance to reach the destination on time?

SSC MTS 08/10/2021 (Shift-02)

(a) $28\frac{1}{3}$ (b) 28
(c) 24 (d) $26\frac{2}{3}$

235. A train has to cover 370 km at a uniform speed. After running 100 km, the train started runing at a speed 5 km/h less than its normal speed due to some technical fault. The train got delayed by 36 minutes. What is the normal speed of the train, in km/h?

SSC CGL 13/08/2021 (Shift-03)

(a) 48 (b) 45
(c) 40 (d) 50

236. A train runs first 75 km at a certain uniform speed and next 90 km at an average speed of 10 km/h more than the normal speed. If it takes 3 hours to complete the journey, then how much time will the train take to cover 300 km with normal speed?

SSC CGL 16/08/2021 (Shift-01)

(a) 5 hrs 15 min. (b) 5 hrs
(c) 6 hrs (d) 5 hrs 25 min.

237. Akhil takes 30 minutes extra to cover a distance of 150 km if he drives 10 km/h slower than his usual speed. How much time will he take to drive 90 km if he drives 15 km/h slower than his usual speed?

SSC CGL 18/08/2021 (Shift-01)

(a) 2 h 15 m (b) 2 h
(c) 2 h 45 m (d) 2 h 30 m

238. A takes 2 hours more than B to cover a distance of 40 km. If A doubles his speed, he takes $1\frac{1}{2}$ hour more than B to cover 80 km. To cover a distance of 120 km, how much time (in hours) will B take travelling at his same speed?

SSC CGL 20/08/2021 (Shift-01)

(a) $1\frac{1}{3}$ (b) $1\frac{2}{3}$
(c) $1\frac{1}{4}$ (d) $1\frac{1}{2}$

239. Mohan takes 2 hours more than Kishore to walk 63 km. If Mohan increases his speed by 50%, then he can make it in 1 hour less than Kishore. How much time does Kishore take to walk 63 km?

SSC CHSL 06/08/2021 (Shift-03)

(a) 6 hours (b) 7 hours
(c) 5 hours (d) 9 hours

240. The speed of a car is 40% more than that of a bus. A train covers 1020 km in $8\frac{1}{2}$ hours. How much distance will the car cover in $1\frac{3}{4}$ hours if the speed of the bus is half the speed of the train?

SSC CHSL 09/08/2021 (Shift-02)

(a) 174 km (b) 147 km
(c) 164 km (d) 145 km

241. A person moved from place A for place B at 2 p.m. at a speed of 4.5 km/h, stayed at place B for 1.5 hours and returned to place A at a speed of 6 km/h. He came back to place A at 7 p.m. What is the distance between places A and B (in km)?

SSC CHSL 13/04/2021 (Shift-03)

(a) $8\frac{1}{3}$ (b) 9
(c) $9\frac{6}{11}$ (d) $8\frac{2}{5}$

242. A takes 2 hours 30 minutes more than B to walk 40 km. If A doubles his speed, then he can make it in 1 hour less than B. How much time (in hours) does A require for walking a 40 km distance?

SSC CPO 23/11/2020 (Shift-01)

(a) 7 (b) 5
(c) 6 (d) 9

243. A takes 2 hours more than B to cover a distance of 40 km. If A doubles his speed, he takes $1\frac{1}{2}$ hours more than B to cover 80 km. To cover a distance of 90 km, how much time will B take travelling at his same speed ?

SSC CGL TIER-II 15/11/2020 (Shift-01)

(a) $1\frac{1}{8}$ hours (b) $1\frac{3}{8}$ hours
(c) $1\frac{1}{6}$ hours (d) $1\frac{1}{3}$ hours

244. A person has to cover a distance of 160 km in 15 hours. If he covers $\frac{4}{5}$ of the distance in $\frac{2}{3}$ of the time, then what should be his speed (in km/h) to cover the remaining distance in the remaining time?

SSC CGL TIER-II 15/11/2020 (Shift-01)

(a) 6 (b) 6.5
(c) 6.4 (d) 8

245. Travelling at 60 km/h, a person reaches his destination in a certain time. He covers 60% of his journey in $\frac{2}{5}$th of the time. At what speed (in km/h) should he travel to cover the remaining journey so that he reaches the destination right on time?

SSC CGL TIER-II 11/09/2019 (Shift-01)

(a) 36
(b) 42
(c) 40
(d) 48

246. Speed of a train is 30 percent more than the speed of a car. Both start from point P at the same time and reach point Q at the same time. P and Q are 130 km apart from each other. On the way train stops for 30 minutes at a station. What is the speed of the train?

SSC CHSL 14/03/2023 (Shift-01)

(a) 78 km/hr (b) 72 km/hr
(c) 60 km/hr (d) 70 km/hr

247. X and Y travel a distance of 90 km each such that the speed of Y is greater than that of X. The sum of their speeds is 100 km/h and the total time taken by both is 3 hours 45 minutes. The ratio of the speed of X to that of Y is:

SSC CGL TIER-II 03/02/2022

(a) 2 : 3 (b) 1 : 3
(c) 2 : 4 (d) 1 : 4

248. Two cyclist X and Y start at the same time from place A and go towards place B at a speed of 6 km/h and 8 km/h, respectively. Despite stopping for 15 minutes during the journey, Y reaches 10 minutes earlier than X. The distance between the places A and B is:

SSC CGL 06/03/2020 (Shift-01)

(a) 6 km (b) 16.5 km
(c) 10 km (d) 8 km

249. A man takes 6 hours to go to a place and come back by walking both the ways. He could have saved 2 hours by riding both the ways. The distance covered in the whole journey is 20 miles. What is the average speed for the whole journey if he goes by walking and comes back by riding?

SSC MTS 02/05/2023 (Shift-01)

(a) 8 miles/hr (b) 5 miles/hr
(c) 6 miles/hr (d) 4 miles/hr

ANSWER KEY

1.	(d)	2.	(c)	3.	(a)	4.	(a)	5.	(c)	6.	(d)	7.	(c)	8.	(c)	9.	(d)	10.	(d)
11.	(c)	12.	(b)	13.	(c)	14.	(a)	15.	(d)	16.	(b)	17.	(a)	18.	(d)	19.	(d)	20.	(d)
21.	(b)	22.	(b)	23.	(c)	24.	(a)	25.	(d)	26.	(a)	27.	(b)	28.	(c)	29.	(b)	30.	(b)
31.	(a)	32.	(c)	33.	(b)	34.	(c)	35.	(a)	36.	(d)	37.	(a)	38.	(a)	39.	(b)	40.	(a)
41.	(b)	42.	(c)	43.	(c)	44.	(d)	45.	(c)	46.	(a)	47.	(c)	48.	(a)	49.	(a)	50.	(d)
51.	(c)	52.	(c)	53.	(c)	54.	(b)	55.	(d)	56.	(d)	57.	(d)	58.	(b)	59.	(a)	60.	(d)
61.	(c)	62.	(a)	63.	(d)	64.	(c)	65.	(c)	66.	(c)	67.	(d)	68.	(a)	69.	(b)	70.	(d)
71.	(c)	72.	(a)	73.	(d)	74.	(c)	75.	(b)	76.	(a)	77.	(c)	78.	(d)	79.	(a)	80.	(a)
81.	(c)	82.	(d)	83.	(a)	84.	(b)	85.	(a)	86.	(b)	87.	(b)	88.	(a)	89.	(a)	90.	(c)
91.	(a)	92.	(c)	93.	(a)	94.	(c)	95.	(c)	96.	(b)	97.	(d)	98.	(b)	99.	(d)	100.	(a)
101.	(b)	102.	(a)	103.	(b)	104.	(a)	105.	(a)	106.	(a)	107.	(c)	108.	(a)	109.	(a)	110.	(b)
111.	(d)	112.	(c)	113.	(c)	114.	(a)	115.	(c)	116.	(a)	117.	(b)	118.	(c)	119.	(c)	120.	(c)
121.	(b)	122.	(d)	123.	(a)	124.	(c)	125.	(b)	126.	(c)	127.	(b)	128.	(c)	129.	(c)	130.	(c)
131.	(c)	132.	(b)	133.	(b)	134.	(c)	135.	(b)	136.	(c)	137.	(c)	138.	(c)	139.	(b)	140.	(c)
141.	(b)	142.	(a)	143.	(b)	144.	(d)	145.	(b)	146.	(a)	147.	(c)	148.	(a)	149.	(c)	150.	(a)

151.	(d)	152.	(d)	153.	(a)	154.	(a)	155.	(d)	156.	(b)	157.	(d)	158.	(b)	159.	(c)	160.	(b)
161.	(b)	162.	(b)	163.	(b)	164.	(d)	165.	(b)	166.	(a)	167.	(c)	168.	(d)	169.	(d)	170.	(c)
171.	(b)	172.	(d)	173.	(b)	174.	(d)	175.	(c)	176.	(a)	177.	(d)	178.	(a)	179.	(a)	180.	(c)
181.	(c)	182.	(c)	183.	(d)	184.	(b)	185.	(a)	186.	(b)	187.	(b)	188.	(d)	189.	(b)	190.	(c)
191.	(b)	192.	(c)	193.	(b)	194.	(a)	195.	(c)	196.	(a)	197.	(b)	198.	(c)	199.	(c)	200.	(a)
201.	(b)	202.	(b)	203.	(b)	204.	(a)	205.	(c)	206.	(c)	207.	(a)	208.	(c)	209.	(b)	210.	(a)
211.	(c)	212.	(c)	213.	(c)	214.	(a)	215.	(a)	216.	(d)	217.	(b)	218.	(b)	219.	(d)	220.	(a)
221.	(b)	222.	(b)	223.	(a)	224.	(d)	225.	(a)	226.	(c)	227.	(a)	228.	(a)	229.	(b)	230.	(b)
231.	(d)	232.	(d)	233.	(d)	234.	(d)	235.	(d)	236.	(c)	237.	(b)	238.	(d)	239.	(b)	240.	(b)
241.	(b)	242.	(a)	243.	(a)	244.	(c)	245.	(c)	246.	(a)	247.	(a)	248.	(c)	249.	(d)		

SOLUTIONS

1. (d) (a) $20 \times \frac{18}{5} = 72$ km/hr

72 km/hr < 85 km/hr

(b) $T = \frac{D}{S}$

(c) Time $\propto \frac{1}{\text{Speed}}$

(d) $99 \times \frac{5}{18}$ m/s < 24 m/s (×)

Hence, option (d) is the correct answer

2. (c) Speed $= \frac{\text{Distance}}{\text{Time}}$

Speed $= \frac{1600 \text{ meter}}{4 \times 60 \text{ sec.}}$

$= \frac{1600}{4 \times 60} \times \frac{18}{5}$ km/hr

Speed = 24 km/hr

3. (a) Speed $= \frac{200}{24} = \frac{25}{3}$ m/s

$= \frac{25}{3} \times \frac{18}{5} = 30$ km/h

4. (a) Speed $= 15 \times \frac{18}{5} = 54$ km/hr

∴ Time $= \frac{162}{54} = 3$ hrs.

5. (c) Speed $= \frac{100000}{1000}$ m $= 100$ m/s

Time required to cover 1 km

$= \frac{1000}{100} = 10$ sec.

6. (d) Given,

Speed of bus = 60 km/h

If distance → constant

Speed $\propto \frac{1}{\text{time}}$

Time → 50 : 20

Speed → 2 : 5

↓ ↓

60 km/hr 150 km/hr

7. (c) Let distance = d and initial speed = s

ATQ,

Distance is same in both condition

s × 16 = (s + 20) × 12

⇒ s = 60

Distance = 60 × 16 = 960 km

Alternate Method:

∵ Distance is constant

Speed $\propto \frac{1}{\text{Time}}$

$$\begin{array}{lccc} \text{Time} \to & 16\text{ h} & & 12\text{ h} \\ \text{Speed} \to & 3 & : & 4 \end{array}$$

$\underbrace{3 \quad : \quad 4}_{\text{diff.}}$

1 unit = 20 km/h

∴ Distance covered by the car

= 16 × 3 × 20 = 960 km

8. (c) Total distance $= 36 \times \frac{85}{60} = 51$ km

∴ Speed $= \frac{51}{51} \times 60 = 60$ km/hr.

9. (d) Total distance $= 5 \times 3\frac{3}{4}$ km

$= 5 \times \frac{15}{4} = \frac{75}{4}$ km

Speed of cycle $= \frac{\frac{75}{4}}{2\frac{1}{6}}$ km/hr

$= \frac{75}{4} \times \frac{6}{13} = \frac{225}{26} = 8\frac{17}{26}$ km/hr

Alternate Method:-

ATQ,

∴ Distance is same.

$5 \times \frac{15}{4} = s \times \frac{13}{6}$

$s = \frac{225}{26} = 8\frac{17}{26}$ km/h

10. (d) Total distance

$= 4 \times 6\frac{15}{60} = 4 \times 6\frac{1}{4} = 4 \times \frac{25}{4} = 25$ km

Speed of cycle

$= \frac{25}{5\frac{1}{6}} = \frac{25 \times 6}{31} = \frac{150}{31} = 4\frac{26}{31}$ km/hr.

Alternate Method:-

∵ Distance is same.

ATQ,

$4 \times \frac{25}{4} = s \times \frac{31}{6}$

$s = \frac{150}{31} = 4\frac{26}{31}$ km/h

11. (c) Distance is constant.

Then, time $\propto \frac{1}{\text{Speed}}$

45 min 30 min

Time → 3 : 2

Speed → 2 : 3

×30 ↓ ↓ ×30

60km/h 90km/h

D's speed = 90km/h

Alternate Method:

Let, D's speed = S

$60 \times \frac{3}{4} = S \times \frac{1}{2}$

∴ D's speed = 90km/h

12. (b) 180 min = 3hr

Distance = Speed × Time

= 60 × 3 = 180km

Time taken to cover same distance

$= \frac{180}{40} = 4\frac{1}{2} = 4$hr 30min.

13. (c) Given,

T = 2 hour 10 min $= 2\frac{1}{6} = \frac{13}{6}$ hour

Speed = 12 km/h

$D = \frac{13}{6} \times 12 = 26$ km

Time taken by cycle $= \frac{26}{13} = 2$ hour

= 120 min

14. (a) Consumption ∝ distance

×8 (4 liter ⟶ 90 km) ×8

32 liter ⟶ 720 km

The car will travel 720 km in 32 litre petrol

15. (d) Distance between P and Q

= 720 km

Speed = 20 m/s

$= 20 \times \frac{18}{5} = 72$ km/h

∴ Time $= \frac{D}{S} = \frac{720}{72} = 10$ hr

Train leaves P at 6 am

6 am + 10 hrs = 4 pm

Train stops on the way for 1 hour 30 min

∴Time when it will reach at Q

= (4 + 1 : 30 min) pm

= 5 : 30 pm

16. (b)

Speed	Time	Distance
100 km/h	$\frac{1}{2}$ h	50 km
80 km/h	$\frac{240}{80} = 3$ h	Remaining distance = 290 − 50 = 240 km

∴ Total time = 0.5 + 3 = 3.5 hours

17. (a) Let, Remaining distance travelled = x km/h
ATQ,
$$\frac{2}{5}\times 900\times\frac{1}{60}+\frac{3}{5}\times 900\times\frac{1}{x}=11$$
$$\Rightarrow 6+\frac{540}{x}=11 \Rightarrow 540 = 11x-6x$$
$$\Rightarrow x=\frac{540}{5}=108 \text{ km/h}$$

18. (d) Speed after repairing = 108 km/h
Speed before repairing = 72 km/h
ATQ,
Distance = x = 108 × 3 = 324 km
Time taken to cover $5x$ distance before repairing = $\frac{5x}{72}$ hours
$$=\frac{5\times 324}{72}=\frac{5\times 18}{4}=\frac{45}{2}$$
= 22 hours 30 minutes

19. (d) Let, Total distance = $3x$
ATQ,
Total time = 12 hours
$$\Rightarrow \frac{x}{30}+\frac{2x}{40}=12 \Rightarrow \frac{10x}{120}=12 \Rightarrow x=144$$
∴ Total distance of journey = 3 × 144
= 432 km

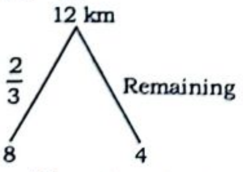
20. (d) Remaining distance = $\frac{88}{2}$ = 44 km

Remaining time = $\frac{1}{4}$ × 16 = 4 hrs

∴ Required speed = $\frac{44}{4}$ = 11 km/hr

21. (b) Let, speed of last one third of distance = x km/h

Time = $\frac{78}{60}=\frac{13}{10}$ hr



$$\frac{8}{10}+\frac{4}{x}=\frac{13}{10} \Rightarrow \frac{4}{x}=\frac{13}{10}-\frac{8}{10}$$
$\Rightarrow x$ = 8 km/hr

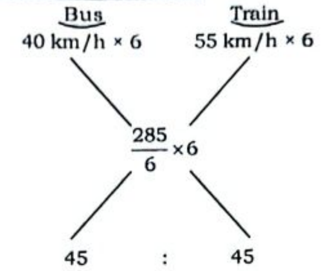
22. (b) Let the total distance 4D
ATQ,
$$4D\times\frac{1}{4}=D$$
Remaining = 3D
$$\frac{D}{5}+\frac{3D}{15}=50 \Rightarrow \frac{6D}{15}=50$$
$$\Rightarrow D=\frac{50\times 15}{6}$$
Total distance = 4D
$$=\frac{50\times 15\times 4}{6}=500 \text{ km}$$

23. (c) Let, Distance travelled by train be x.
ATQ,
$$\frac{x}{55}+\frac{285-x}{40}=6$$
$$\Rightarrow \frac{8x+11(285-x)}{11\times 5\times 8}=6$$
$$\Rightarrow 8x+11\times 285-11x=6\times 11\times 5\times 8$$
$$\Rightarrow 3135-2640=3x \Rightarrow 495=3x$$
∴ x = 165 km

Alternate Method:

By options, First try to take that option which is multiple of 55.
165 is divisible by 55.
So, Let distance travelled by train = 165 km
ATQ,
$$6=\frac{165}{55}+\frac{285-165}{40}$$
$$\Rightarrow 6=3+3 \Rightarrow 6=6$$
Hence distance traveled by train = 165 km

Alternate Method:



Time → $\underset{3\text{ h}}{1}$: $\underset{3\text{ h}}{1}$ → 6 h

∴ Distance cover by train = 55 × 3
= 165 km

24. (a) Let, Speed = x km/h
ATQ,
$$56\times\frac{3}{2}=7\times x$$
∴ x = 12 km/hr

25. (d) 60% = $\frac{3}{5}$

If distance is constant

Speed ∝ $\frac{1}{\text{Time}}$

Usual New
Speed → 5 : 3
Time → 3 : 5
2 unit ⟶ 36 min
↓
54 min

26. (a)
Usual : Now
Speed → 7 : 6
Time → 6 : 7
×20 diff.
1 unit = 20 min.
120 min. = 2 hrs.

27. (b)
Old New
Speed 4 1
Time 1 4
+3

ATQ,
3 unit → 45 min
Usual time (1 unit) → 15 min

28. (c) Since Distance is same

Speed ∝ $\frac{1}{\text{Time}}$

Speed 5 : 9
Time 9 : 5
4 → 40 min
↓
90 min

29. (b) If distance is same then

Speed ∝ $\frac{1}{\text{Time}}$

Speed → 55 : 45
Time → 45 : 55
×4
220 min
10 unit → 40 min
1 unit → 4 min
Distance = speed × Time
$$=45\times\frac{220}{60}=165 \text{ km}$$

30. (b) ∵ Time is constant.
∴ Speed ∝ Distance
Speed → 12 : 18 ⇒ 2 : 3
Distance → $\underbrace{2 : 3}$
1 unit = 24 km
∴ Actual distance (2 unit) = 48 km

31. (a) 25% = $\frac{1}{4}$
ATQ,

Intial Final
Speed → 4 : 3
Time → $\underbrace{3 : 4}_{1}$

Increase in time = $\frac{1}{3}$

→ lady gets late by $\frac{1}{3}$ on that day

32. (c) Speed of A → 1 : 2
Time of A → 2 : 1
1 unit = 4 hour
2 unit = $\frac{4}{1}\times 2$ = 8 hours

33. (b) Speed → 1 : 2
Time → $\underbrace{2 : 1}$
1 unit → 8 − 3 = 5hrs
Time taken by A when be doubles his speed = 5 hrs
Time taken by B = 5 − 3 = 2 hrs
∴ Speed of B = $\frac{160}{2}$ = 80 km/hr

34. (c) A
↓
Speed → 1 : 2
Time → 2 : 1
Diff.
1 unit → $\left(2\frac{2}{3}+1\frac{1}{3}\right)$
1 unit → 4 hours
2 unit → 8 hours
Speed of A = $\frac{416}{8}$ = 52 km/hr

Alternate Method:

$\Rightarrow D = 416 = \frac{S_A \times 2S_A}{S_A} \times \left[\frac{8}{3} + \frac{4}{3}\right]$

$\Rightarrow 416 = 2S_A \times \frac{12}{3}$

$\Rightarrow S_A = 52$ kmph

35. (a) A

$\downarrow$

Speed → 1 : 2

Time → $\underbrace{2 \;:\; 1}_{\text{Diff.}}$

1 unit →(30 minute + 1 hr)

1 unit → 1.5 hours

2 unit→ 3 hours

A take 30 minute more time than B

So, B's time = 3 hr – 30 minute = 2.5 hr

Speed of B = $\frac{15}{2.5}$ = 6 km/hr

Alternate Method:

$D = 15 = \frac{S_A \times 2S_A}{S_A} \times \frac{3}{2}$

$\Rightarrow S_A = 5$ kmph

Now,

$15 = \frac{S_A \times S_B}{S_B - S_A} \times \frac{1}{2} \Rightarrow 15 = \frac{5 \times S_B}{S_B - 5} \times \frac{1}{2}$

$\Rightarrow 6 = \frac{S_B}{S_B - 5} \Rightarrow S_B = 6$km (satisfied)

36. (d) Let, Total distance = 2d

ATQ,

$6 = \frac{d}{75} + \frac{d}{60} \Rightarrow 6 = \frac{9d}{300} \Rightarrow d = 200$

∴ Total distance = 2 × 200 = 400 km

Alternate Method:-

Total Distance = $\frac{2 \times S_1 \times S_2}{S_1 + S_2} \times 6$

Total Distance = $\frac{2 \times 60 \times 75}{135} \times 6$

= 400 km

37. (a) Avg. speed = $\frac{2 \times 8 \times 2}{8 + 2}$ = 3.2km/h.

Total distance = 3.2 × 4 = 12.8 km.

∴ One side distance = $\frac{12.8}{2}$ = 6.4 km.

38. (a) S_1 = 15 km/hrs, S_2 = 10 km/hrs.

Average Speed = $\frac{2 \times S_1 \times S_2}{S_1 + S_2}$

$= \frac{2 \times 15 \times 10}{(15 + 10)} = 12$ km/h

∴ Distance = speed × time

$2x = 12 \times \frac{5}{2} = 30 \Rightarrow x = 15$ km.

Alternate Method:

$D = \frac{S_1 \times S_2}{S_1 + S_2} \times t = \frac{15 \times 10}{25} \times \frac{5}{2} = 15$ km.

39. (b) ATQ,

Distance = $\frac{2 \times S_1 \times S_2}{S_1 + S_2} \times t$

$= \frac{2 \times 21 \times 24}{21 + 24} \times 10 = \frac{2 \times 21 \times 24}{45} \times 10$

= 224 km

40. (a) 20m/s × $\frac{18}{5}$ = 72 km/hrs

Let, Total distance = $2x$ km.

ATQ,

$\Rightarrow \frac{x}{60} + \frac{x}{72} = \frac{11}{2}h \Rightarrow \frac{6x + 5x}{360} = \frac{11}{2}$

$\Rightarrow \frac{11x}{360} = \frac{11}{2} \Rightarrow x = 180$ km

Total distance = $2x$ = 360 km

41. (b) Average speed = $\left(\frac{2S_1 \times S_2}{S_1 + S_2}\right)$

$= \frac{2 \times \frac{11}{2} \times 4}{\frac{11}{2} + 4} = \frac{44}{\frac{19}{2}} = \frac{88}{19}$ km/h

Time = $4\frac{3}{4}$ hrs = $\frac{19}{4}$ hrs

∴ Distance = $\frac{88}{19} \times \frac{19}{4}$ = 22 km

Alternate Method:

We know,

Distance = $\frac{(x \times y)}{x + y} \times t$

$= \frac{\frac{11}{2} \times 4}{\frac{11}{2} + 4} \times \frac{19}{4} = \frac{11 \times 19}{19} = 11$ km.

∴ Total distance = 2 × 11 = 22 km

42. (c) Given,

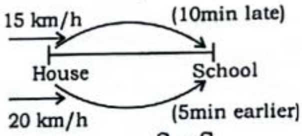
Time = 3 hour 45 minute

$= 3 + \frac{3}{4} = \frac{15}{4}$ hrs.

Distance = $\frac{2 \times S_1 \times S_1}{S_1 + S_2}$ × time

$= \frac{2 \times 8 \times 12}{8 + 12} \times \frac{15}{4} = 36$ km

43. (c)



Total distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta$Time

$= \frac{15 \times 20}{5} \times (10 + 5) \times \frac{1}{60}$

$= \frac{15 \times 20}{5} \times \frac{15}{60} = 15$ km

Alternate Method:

Speed → 15 : 20

3 : 4

Time → 4 : 3

1 unit → 15 min.

60 min. = 1 hr

∴ Distance = 15 × 1 = 15 km.

44. (d) Distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t$

$= \frac{8 \times 6}{8 - 6} \times \frac{5}{60} = 2$ km.

45. (c) Distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t$

$= \frac{4 \times 3}{4 - 3} \times \frac{60}{60} = 12$ km.

46. (a) ATQ,

Distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta$time

$= \frac{12 \times 16}{4} \times \frac{20}{60} = 16$ kms

47. (c) Distance is constant

∴ Speed ∝ $\frac{1}{\text{Time}}$

Ratio of speeds = 80 : 50

Time = 5 : 8

(8 – 5) = 3 unit = (60 + 48)

1 unit = 36 minutes

Actual time = 36 × 5 + 60

= 180 minutes + 60 minutes

= 240 minutes

Distance = $\frac{80 \times 180}{60}$ km = 240 km

∴ Actual speed = $\frac{240}{240} \times 60$ = 60 km/h

Alternate Method:

$D = \frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t = \frac{80 \times 50}{30} \times \frac{108}{60}$

= 240 km

Now, Time A = $\frac{240}{80}$ = 3hrs

Which is 60 min early

Actual time = 4 hrs

Actual speed = $\frac{240}{4}$ = 60 kmph.

48. (a) ∵ Distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t$

$= \frac{40 \times 50}{(50 - 40)} \times \frac{15}{60} = \frac{40 \times 50}{10} \times \frac{15}{60} = 50$ km

Alternate Method:

Speed → 40 : 50

4 : 5

Time → 5 : 4

1 unit → 25 – 10 = 15 min.

4 unit → 60 min. = 1 hr.

∴ Distance = 50 × 1 = 50 km.

49. (a) Distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t$

Distance = $\frac{24 \times 30}{30 - 24} \times \frac{9}{60}$

$= \frac{24 \times 30}{6} \times \frac{9}{60} = 18$ km.

Time at 27 km/h. = $\frac{18}{27} = \frac{2}{3} \times 60$

= 40 minutes

50. (d) Distance = $\frac{S_1 \times S_2}{S_1 - S_2} \times \Delta T$

$= \frac{45 \times 40}{5} \times 1 = 360$ km

51. (c) If distance is constant.

Then, Speed ∝ $\frac{1}{\text{Time}}$

Speed → 10 : 15 ⇒ 2 : 3

Time → $\underbrace{3 : 2}$

Time diff. = 1 unit = 10 + 5 = 15 min

Initial time = 3 unit = 45min = $\frac{3}{4}$ hrs.

∴ Distance = $\frac{3}{4} \times 10$ = 7.5 km.

Alternate Method:

$$\text{Distance} = \frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t$$

$$= \frac{10 \times 15}{5} \times \frac{15}{60} = 7.5 \text{ km}$$

52. (c) Let, Total distance of AB = x km.

A.T.Q,

Time difference = 15 min

$$\frac{x}{32} - \frac{x}{40} = \frac{15}{60} \Rightarrow \frac{5x - 4x}{160} = \frac{1}{4}$$

$\therefore x = 40$ km.

53. (c) $D = \frac{S_1 \times S_2}{S_1 - S_2} \times \Delta T \Rightarrow D = \frac{60 \times 30}{30} \times 1$

$\therefore$ Distance = 60 km

54. (b) Let, Somya's speed = S

$$\because \text{Distance} = \frac{S_1 \times S_2}{S_2 - S_1} \times T$$

$$50 = \frac{S \times 2S}{2S - S} \times 2$$

$\therefore$ S = 12.5 kmph

55. (d) ATQ,

$$D = \frac{S_1 \times S_2}{S_1 - S_2} \times \Delta \text{ time}$$

$$\Rightarrow D = \frac{7}{2} \times \frac{9}{2} \times \frac{16}{60} \Rightarrow D = 4.2 \text{ km}$$

56. (d) Average speed = $\frac{2xy}{x+y}$

$$\therefore \text{Ave. speed} = \frac{2 \times 40 \times 20}{20 + 40}$$

$$= \frac{160}{6} = 26\frac{2}{3} \text{ km./hr.}$$

57. (d) Average speed = $\frac{2xy}{x+y}$

$$= \frac{2 \times 30 \times 50}{30 + 50} = 37.5 \text{ km/hr}$$

58. (b) Speed $\propto \frac{1}{\text{Time}}$

S → 40 : 60

T → 3 : 2

5 unit → 7 hrs

1 unit → $\frac{7}{5}$ hrs

$$\text{Total distance} = 40 \times 3 \times \frac{7}{5} \times 2$$

$$= 48 \times 7 \text{ km}$$

$$\text{Average Speed} = \frac{48 \times 7}{7} = 48 \text{ km/h}$$

Alternate method :

$$\text{Average speed} = \frac{2 \times 40 \times 60}{(40 + 60)} = 48 \text{ km/h}$$

59. (a) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$\therefore \text{Average speed} = \frac{90 + 240}{1 + 2} = \frac{330}{3}$$

$$= 110 \text{ km/hr.}$$

60. (d) If distance is same then

$$\text{Average speed} = \frac{2S_1 S_2}{S_1 + S_2}$$

$$= \frac{2 \times 90 \times 65}{90 + 65} = 75.48 \text{ km/hr}$$

61. (c) Average speed = $\frac{2 \times S_1 \times S_2}{S_1 + S_2}$

$$= \frac{2 \times 110 \times 76}{(110 + 76)} = \frac{110 \times 76}{93}$$

$$= 89\frac{83}{93} \text{ km/h}$$

62. (a) Let distance = 100 unit

Speed of going = x

Speed of coming = $4x$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$\Rightarrow 15 = \frac{100 + 100}{\frac{100}{x} + \frac{100}{4x}} \Rightarrow 15 = \frac{200 \times 4x}{100(4 + 1)}$$

$$\Rightarrow x = \frac{75}{8} \text{ (speed of going)}$$

Alternate Method:

$$\text{Average speed} = \frac{2 \times S_1 \times S_2}{S_1 + S_2}$$

$$15 = \frac{\left(x \times \frac{1}{4}x\right) \times 2}{x + \frac{1}{4}x} \Rightarrow \frac{5}{4}x \times 15 = \frac{x^2}{2}$$

$$\Rightarrow \frac{75}{2} = x$$

$$\therefore \text{ Speed of going} = \frac{x}{4} = \frac{75}{8} \text{ kmph}$$

63. (d) Let, Distance = 1800km

$$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

$$= \frac{3 \times 1800}{\frac{1800}{40} + \frac{1800}{45} + \frac{1800}{60}}$$

$$= \frac{5400}{45 + 40 + 30} = \frac{5400}{115} \text{ km/hr}$$

= 46.96 km/hr.

Alternate Method:

Speed → 40 km/h. 45 km/h. 60 km/h.

Let, Dis. = LCM (40,45,60) = 360

Time → 9 : 8 : 6

$$\text{Avg. speed} = \frac{3 \times 360}{9 + 8 + 6} = \frac{3 \times 360}{23}$$

$$= 46.96 \text{ km/h}$$

Alternate Method:

Since, distance is equal

Given, x = 40 km/h

y = 45 km/h, z = 60 km/h

$$\therefore \text{ average speed} = \frac{3xyz}{xy + yz + zx}$$

$$= \frac{3 \times 40 \times 45 \times 60}{1800 + 2700 + 2400} = 46.96 \text{km/h}$$

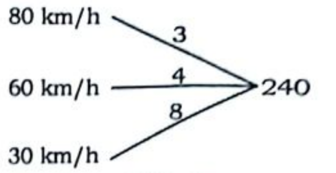
64. (c) Let, Distance = 720 km.

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{240 + 240 + 240}{\frac{240}{80} + \frac{240}{60} + \frac{240}{30}}$$

$$= \frac{720}{3 + 4 + 8} = \frac{720}{15} = 48 \text{ km/hr.}$$

Alternate Method:-



$$\therefore \text{ Average speed} = \frac{240 \times 3}{15} = 48 \text{ km/h}$$

65. (c) Let, Each distance = 720 km

I. = $\frac{720}{720}$ = 1 hr, II. = $\frac{720}{360}$ = 2 hrs

III. = $\frac{720}{180}$ = 4hrs, IV. = $\frac{720}{90}$ = 8hrs

$$\therefore \text{ Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{720 + 720 + 720 + 720}{1 + 2 + 4 + 8}$$

$$= \frac{720 \times 4}{15} = 192 \text{ km/h}$$

66. (c)

1st	2nd	3rd	4th	5th
8	16	32	64	128

Total distance:

8 + 16 + 32 + 64 + 128 = 248

Total time = 5 hours

$$\therefore \text{ Average speed} = \frac{248}{5} = 49.6$$

67.(d) Avg. speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{10 + 15}{\frac{10}{15} + \frac{15}{10}} = \frac{25 \times 30}{20 + 45} = \frac{750}{65}$$

= 11.54 km/hr.

68. (a) Avg. speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{60 + 90}{\frac{60}{40} + \frac{90}{45}} = \frac{150}{1.5 + 2} = \frac{1500}{35} = \frac{300}{7}$$

$$= 42\frac{6}{7} \text{ km/hr.}$$

69. (b) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

Total distance = 50 + 75 = 125 km

$$\text{Total time} = 40 + 40 = \frac{80}{60} = \frac{4}{3} \text{ h}$$

$$\text{Avg. speed} = \frac{125}{4} \times 3 = 93\frac{3}{4} \text{ km/hr}$$

70. (d) Speed of R from office to home

$$= \frac{12.5 \times 60}{30} = 25 \text{ km/h}$$

Speed of R from home to office

$$\frac{12.5 \times 60}{20} = 37.5 \text{ km/h}$$

$$\text{Avg. speed} = \frac{2S_1 S_2}{S_1 + S_2} = \frac{2 \times 25 \times 37.5}{62.5}$$

$$= 30 \text{ km/h}$$

71. (c) Total distance = 4 × 8 + 8 × 4

= 64 km

Total time = 8 + 4 = 12 hr.

$$\text{Avg. speed} = \frac{64}{12} = 5\frac{1}{3} \text{ km/h}$$

72. (a) Average speed = $\frac{75+33}{2} = 54$ km/h

73. (d) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

Total distance = 70 + 60 = 130 km

Total time = 30 + 40 = 70 min

$= \frac{70}{60} = \frac{7}{6}$ hr

$\therefore$ Avg. speed = $\frac{130}{7} \times 6 = 111\frac{3}{7}$ km/hr

74. (c) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

Total distance = 96 + 21 × 5

= 96 + 105 = 201 km

Total time = 6 + 5 = 11 hrs.

$\therefore$ Average speed = $\frac{201}{11} = 18.27$ km/h

75. (b) Total time = $\frac{800}{80} = 10$ hrs.

Time to cover first 320 km.

$= \frac{320}{64} = 5$ hrs.

$\therefore$ Speed of next 480 km. $= \frac{480}{10-5}$

= 96 km/h.

Alternate Method:

Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{800}{\frac{320}{64} + \frac{480}{x}}$

$\Rightarrow \frac{320}{64} + \frac{480}{x} = \frac{800}{80}$

$\Rightarrow 5 + \frac{480}{x} = 10 \Rightarrow \frac{480}{x} = 5$

$\Rightarrow x = 96$ km/hr

76. (a) Let, Total distance be 5 km

Average speed = $\frac{\text{Total Distance}}{\text{Total Time}}$

$= \frac{5}{\frac{2}{45} + \frac{3}{63}} = \frac{5 \times 315}{14+15} = \frac{1575}{29}$

$= 54.31$ km/h ≈ 54 km/h

77. (c) Average Speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{80+70}{\frac{80}{10}+7} = \frac{150}{15} = 10$ km/h.

78. (d) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{180+210}{\frac{180}{20} + \frac{210}{35}} = \frac{390}{15} = 26$ km/h.

79. (a) Total time = $\frac{\text{Total distance}}{\text{Average speed}}$

Time = $\frac{100}{40}$ = 2.5 hour = 150 min

⟶ 100km ⟵

Distance →	60km	20km	(100 – 80 = 20km)
Time →	40min	50min	(150 – 90 = 60min)

⟶ 150min ⟵

Last 20 km is covered in 60 min then speed of S is 20km/h to cover last 20 km.

80. (a) Average time = $\frac{750}{50} = 15$ hours

Take time to travel 200 km

$= \frac{200}{40} = 5$ hours

So,

Remaining distance = 750 – 200 = 550 km

$\therefore$ Speed = $\frac{550}{10} = 55$ km/h

81. (c) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{50+30}{90+15+35} \times 60$ km/hr

$= \frac{80 \times 60}{140} = \frac{240}{7} = 34\frac{2}{7}$ km/hr

82. (d)

	Train	Ship	Plan	Car
Distance→	1200 km	1600 km	1000 km	200 km
Speed→	80	40	400	50
Time→	15 hr	40 hr	2.5 hr	4 hr

Avg. speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{1200+1600+1000+200}{15+40+2.5+4}$

$= \frac{4000}{61.5} = 65.04$ km/hr

83. (a) Avg. speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{72+28+160}{\frac{8}{5}+7+8} = \frac{260 \times 5}{83} = 15.66$km/hr

84. (b) Average speed = $\frac{2 \times S_1 \times S_2}{S_1 + S_2}$

$= \frac{2 \times \frac{1}{x} \times \frac{1}{x^2}}{\frac{1}{x} + \frac{1}{x^2}} = \frac{\frac{2}{x^3}}{\frac{x+1}{x^2}}$

$= \frac{2}{x^3} \times \frac{x^2}{(x+1)} = \frac{2}{x(x+1)} = \frac{2}{x+x^2}$

85. (a) Average speed

$= \frac{\text{Total distance covered}}{\text{Total time taken}} = \frac{60+100}{\frac{60}{45} + \frac{100}{65}}$

$= \frac{160 \times 39}{112} = \frac{390}{7} = 55.71$ km / h

86. (b) Avg. Speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{11+25+30}{\frac{11}{7} + \frac{25}{10} + \frac{30}{20}} = \frac{66}{\frac{220+350+210}{140}}$

$= \frac{66 \times 140}{780} = 11\frac{11}{13}$ km

87. (b) Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

ATQ,

$\therefore$ Avg. speed = $\frac{110+120+60}{\frac{110}{55} + \frac{120}{60} + \frac{60}{60}}$

$= \frac{290}{2+2+1} = \frac{290}{5} = 58$ mile/hour

88. (a) Let, Distance = 1800 km.

Average speed = $\frac{\text{Total Distance}}{\text{Total Time}}$

$= \frac{1800}{\frac{600}{40} + \frac{600}{50} + \frac{600}{60}} = \frac{1800}{15+12+10}$

$= \frac{1800}{37} = 48.65$ km/hr.

Alternate Method:

If distance is equal then

A→ 40 km/h 15

B → 50 km/h 12 600 unit

C→ 60 km/h 10

Average speed = $\frac{3 \times 600}{37} = \frac{1800}{37}$

= 48.65 km/h.

Alternate Method:

Given, x = 40 km/h

y = 50 km/h, z = 60 km/h

If distance is equal then,

Average speed = $\frac{3xyz}{xy+yz+zx}$

$= \frac{3 \times 40 \times 50 \times 60}{40 \times 50 + 50 \times 60 + 60 \times 40}$

$= \frac{1800}{37} = 48.65$km/h

89. (a) Let, the total distance = 900 unit

900 km

	30%	45%	Remaining
Distance →	270	405	225
Speed →	90 km/h	135 km/h	75 km/h
Time →	3	3	3

Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{900}{9} = 100$ km/h

90. (c) Quarter of an hour = $60 \times \frac{1}{4} = 15$ min.

Total time = 15 + 15 + 15 = 45 min.

Total distance = 20 + 15 + 25 = 60 km

Avg, speed = $\frac{60}{\frac{45}{60}} = \frac{60 \times 60}{45}$

= 80 km/h.

91. (a) Let, Total distance = 400 km

400 km

	$\frac{1}{4}$th	$\frac{1}{2}$	Remaining
Distance →	100	200	100
Speed →	25 km/h	40 km/h	50 km/h
Time →	4	5	2

$\therefore$ Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{100 \times 4}{4+5+2} = \frac{400}{11} = 36\frac{4}{11}$ km/h

92. (c) Let, Total distance = 15 km

15 km

$\frac{2}{3}$ $\frac{1}{5}$

Distance→ 10 3 2

Total time = $\frac{10}{15} + \frac{3}{25} + \frac{2}{50} = \frac{124}{150}$ h

Avg. speed = $\frac{15}{124} \times 150$

= 18.15 km/h (Approx)

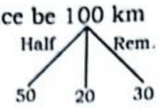
93. (a)

Distance →	81	12	270
Speed →	27 km/h	6 km/h	45 km/h
Time →	3	2	6

Avg. speed $= \frac{\text{Total distance}}{\text{Total time}} = \frac{363}{3+2+6}$
$= 33$ km/h.

94. (c) $40\% = \frac{2}{5}$

Let total distance be 100 km



ATQ,

Average speed $= \dfrac{100}{\frac{50}{35}+\frac{20}{8}+\frac{30}{18}}$

$= \dfrac{100}{\frac{10}{7}+\frac{5}{2}+\frac{15}{9}} = \dfrac{126 \times 100}{180+315+210}$

$= \frac{12600}{705} = \frac{840}{47}$ kmph

95. (c) Let, Total distance = 12 km

Average speed $= \frac{\text{Total Distance}}{\text{Total Time}}$

$= \dfrac{12}{\frac{4}{10}+\frac{3}{15}+\frac{5}{20}} = \dfrac{12}{\frac{51}{60}} = \dfrac{12 \times 60}{51}$

$= \frac{240}{17}$ km/h

96. (b) Time $= \frac{\text{Distance}}{\text{Speed}}$

Average speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \dfrac{45+80+6}{\frac{45}{15}+\frac{80}{40}+\frac{6}{2}}$

$= \frac{131}{3+2+3} = \frac{131}{8} = 16.38$ km/h

97. (d) Distance = Speed × Time
Distance travelled by Car
$= 40 \times 3 = 120$ km
Distance travelled by Bike
$= 30 \times 2 = 60$ km
Distance travelled by Train
$= 80 \times 5 = 400$ km

Average Speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \frac{120+60+400}{3+2+5}$
$= 58$km/h

98. (b) Given,
Speed = 21 m/s
Time = 10 m = 600 s
Distance = Speed × Time
= 21 × 600
= 12600
= 12.6 km

Hence, Total Distance Covered
= 12.6 + 9 + 10 = 31.6 km
Total Time Taken

$= 10 + 10 + 10 = 30 \times \frac{1}{60}\text{h} = 0.5\text{h}$

$\Rightarrow$ Average Speed $= \frac{31.6 \text{ km}}{0.5\text{h}} = 63.2$ km/h

99. (d) Let, Total distance = 12 unit
Travelled distance = 8 : 3 : 1

Average speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \dfrac{12}{\frac{8}{45}+\frac{3}{60}+\frac{1}{75}} = \dfrac{12 \times 15 \times 60}{160+45+12}$

$= 49.76$ km/h ≈ 49.77 km/h

100. (a)

Lap	Distance	Time	Speed
First	200 km	4 h	50 km/h
Second	162 km	$\frac{D}{S} = \frac{162}{15} \times \frac{5}{18}$ $= 3$ h	15 m/s
Third	—	4 h	—

Total distance = Speed × Total time
$= 50 \times 11 = 550$ km
Remaining distance for third lap
$= 550 - 362 = 188$ km
∴ Speed of car in third lap

$= \frac{188}{4} = 47$ km/h

101. (b) When distance is same then:

Speed	Distance	Time
10	60	6
15		4
20		3
30		2

∴ Average speed of Raghav

$= y = \frac{4 \times 60}{15} = 16$ km/h

⇒ When time is same then:

Speed	Distance	Time
10	10	1
15	15	1
20	20	1
30	30	1

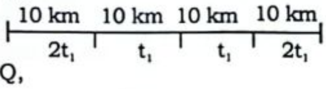
∴ Average speed of Manish

$= z = \frac{10+15+20+30}{4}$

$= \frac{75}{4} = 18.75$ km/h

∴ $(z - y) = 18.75 - 16 = 2.75$

102. (a)



ATQ,

$\frac{10}{2t_1} = 40 \Rightarrow t_1 = \frac{1}{8}$

Avg. speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \dfrac{40}{\frac{1}{4}+\frac{1}{8}+\frac{1}{8}+\frac{1}{4}} = \dfrac{40 \times 8}{2+1+1+2}$

$= \frac{40 \times 8}{6} = \frac{160}{3}$ km/hr.

103. (b) Let, Speed of car = S_1

Average speed $= \frac{\text{Total distance}}{\text{Total time}}$

$73 = \dfrac{\left(\frac{3}{4} \times S_1\right) + \left(\frac{75}{60} \times 85\right) + (3 \times 70)}{5}$

$\Rightarrow 365 = \frac{3}{4}S_1 + \frac{5}{4} \times 85 + 210$

$\Rightarrow 1460 = 3S_1 + 425 + 840$

$\Rightarrow S_1 = \frac{195}{3} = 65$ km/hr

104. (a) Distance = Speed × Time

Avg. speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \dfrac{(6 \times 2) + (2 \times 1) + \left(\frac{18}{5} \times 1\right) + (4 \times 3)}{2+1+1+3+1+\frac{1}{2}}$

$= \frac{148 \times 2}{5 \times 17} = \frac{296}{85} = 3.48$ km/hr.

105. (a) Let, certain speed = x km/h

Average speed $= \frac{\text{Total Distance}}{\text{Total time}}$

$\Rightarrow \dfrac{80+150+x}{1+\frac{3}{2}+4} = 70 \Rightarrow \dfrac{2(230+x)}{13} = 70$

$\Rightarrow 230 + x = 13 \times 35$

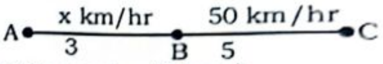
$\Rightarrow 230 + x = 455$

$\therefore x = 225$

225 km is covered in 4 hours.

$\therefore$ Speed $= \frac{225}{4} = 56.25$ km/h

106. (a)



Average speed = 40 kmph

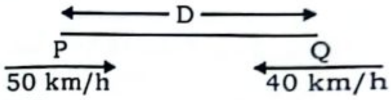
$\dfrac{3+5}{\frac{3}{x}+\frac{5}{50}} = 40$

$\Rightarrow \frac{3}{x}+\frac{1}{10} = \frac{1}{5} \Rightarrow \frac{3}{x} = \frac{1}{5} - \frac{1}{10} = \frac{1}{10}$

$\therefore x = 30$

$(x - 10) : (x + 1) = (30 - 10) : (30 + 1)$
$= 20 : 31$

107. (c)



ATQ,

$\frac{D}{50}+\frac{D}{40}+4 = 22 \Rightarrow D \times \frac{9}{200} = 18$

$\Rightarrow D = 400$ km

Average speed $= \frac{\text{Total distance}}{\text{Time}}$

$= \frac{400 \times 2}{22} = \frac{800}{22} = 36.36$ km/h

108. (a) Distance = 37 km 500 m
= 37.5 km
Time = 90 min. = 1.5 hr.

Avg. speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \frac{37.5}{1.5} = 25$ km/hr.

109. (a) Average Speed $= \frac{\text{Total distance}}{\text{Total time}}$

$= \frac{1200}{30} = 40$ km/h

$\left[\begin{array}{l} \text{km/h} \times \frac{5}{18} = \text{m/s} \\ \text{m/s} \times \frac{18}{5} = \text{km/h} \end{array}\right]$

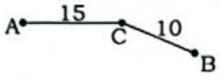
$= 40 \times \frac{5}{18} = \frac{200}{18} = 11\frac{1}{9}$ m/s

110. (b) Given,

Time = 2 hr 20 minute = $\frac{7}{3}$ hr

Distance from A to B = 25 km

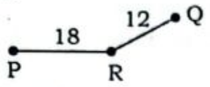
Let the downfall speed is x km/hr



$$\frac{15}{10}+\frac{10}{x}=\frac{7}{3}$$

$$\Rightarrow \frac{10}{x}=\frac{7}{3}-\frac{15}{10} \Rightarrow x = 12 \text{ km/hr}$$

111. (d)



Time = $2\frac{4}{5}=\frac{14}{5}$ hrs

ATQ,

P to R, travelled by 15 km/hr

$$\frac{18}{15}+\frac{12}{x}=\frac{14}{5} \Rightarrow \frac{12}{x}=\frac{8}{5} \Rightarrow x = 7.5$$

∴ Average uphill speed = 7.5 km/h

112. (c) Let, Speed in last hour = x

ATQ,

Remaining distance = 240 – 70 × 3

= 30 km.

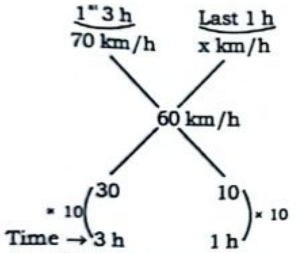
Remaining 30 km distance covered in an hour.

So, speed in last hour = 30 km/hr.

Alternate Method:

Given,

Average speed = $\frac{240}{4}$ = 60 km/h



∴ x = 60 – 30 = 30 km/hr

So, speed in last hour = 30 km/hr.

113. (c) Stop twice for 5 min

Then, time = 60 – 10 = 50 min

50 min → 5 km

10 min → 1 km

60 min → 6 km

Average speed = 6 km/hr

114. (a) 25% = $\frac{1}{4}$, 50% = $\frac{1}{2}$

Let, Total distance be 400 km

Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$=\frac{400}{\frac{100}{25}+\frac{200}{50}+\frac{100}{12.5}}=\frac{400}{4+4+8}$$

= 25 km/hr

115. (c) Let, the time be x.

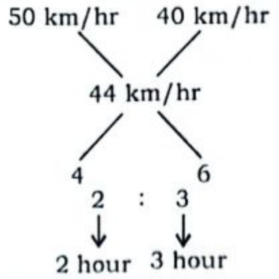
Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$\Rightarrow 44 = \frac{(50\times 2)+(40\times x)}{2+x}$$

⇒ 88 + 44x = 100 + 40x ⇒ 4x = 12

∴ x = 3 hrs.

Alternate Method:



∴ Required time is 3 hours

116. (a) Stoppage time

$$= \frac{90-75}{90}\times 60 = 10 \text{ min}$$

117. (b) Stoppage time = $\frac{60-54}{60}\times 60$ = 6 min

118. (c) Stoppage time

$$= \frac{40-32}{40}\times 60 = \frac{1}{5}\times 60 = 12 \text{ minutes}$$

119. (c) ATQ,

Stoppage time = $\frac{65-52}{65}\times 60$

Stoppage time = $\frac{13}{65}\times 60$ = 12 min/hrs

120. (c) 8 km. travelled in 1 hr.

So,

1 km = $\frac{60}{8}$ min , 1 km = $\frac{15}{2}$ min

6 km = $\frac{15}{2}\times 6$ = 45 min

Extra time = 5 × 4 min = 20 min

∴ Total time = 45 + 20 = 65 min

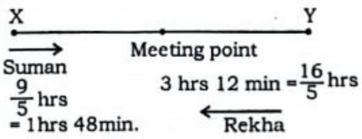
121. (b) We know that:

$$\frac{\text{Speed A}}{\text{Speed B}}=\sqrt{\frac{T_B}{T_A}}$$

$$\Rightarrow \frac{32}{\text{Speed B}}=\sqrt{\frac{8\times 8}{49}}=\frac{8}{7}$$

$$\Rightarrow \text{Speed B}=\frac{32\times 7}{8}=28 \text{ km/hr}$$

122. (d)



$$\Rightarrow \frac{S}{R}=\sqrt{\frac{T_2}{T_1}} \Rightarrow \frac{S}{9}=\sqrt{\frac{\frac{9}{5}}{\frac{16}{5}}}$$

$$\Rightarrow \frac{S}{9}=\frac{3}{4} \Rightarrow S = 6\frac{3}{4}$$

123. (a)

A : B

Speed 6 : 5

Here,

$S_A = 6$, $S_B = 5$

$t_A = p$, $t_B = \frac{36}{5}$

$$\frac{S_A}{S_B}=\sqrt{\frac{t_B}{t_A}}=\frac{6}{5}=\sqrt{\frac{36}{5p}}$$

Square both side

$$\Rightarrow \frac{5p}{36}=\frac{25}{36} \Rightarrow p = 5 \text{ hours}$$

124. (c) After crossing each other

$$\frac{V_1}{V_2}=\sqrt{\frac{t_2}{t_1}}$$

Where V = Speed, t= Time

$$\frac{V_1}{V_2}=\sqrt{\frac{8}{49/8}}=\sqrt{\frac{8\times 8}{49}}=\frac{8}{7}$$

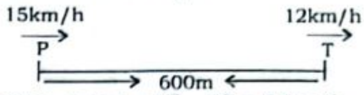
$$=\frac{8}{7}\begin{array}{l}\xrightarrow{\times 2.4} 19.2\\ \xrightarrow[\times 2.4]{} 16.8\end{array}$$

∴ Speed of A = 19.2 km/h

125. (b) $\sqrt{\frac{9}{16}}=\frac{x}{56} \Rightarrow \underbrace{\frac{3}{4}=\frac{x}{56}}_{\times 14}$

x = 3 × 14 = 42 km/h.

126. (c)



Relative speed = 15 – 12 = 3 km/h

$$\text{Time} = \frac{\text{Distance}}{\text{Relative speed}} = \frac{600\times 18}{3\times 5}$$

= 720 sec = 12 min.

127.(b) Relative speed = 11 – 10 = 1 km/hr

= $\frac{5}{18}$ m/sec

Distance in 9 min = $\frac{5}{18}\times 9\times 60$

= 150m

∴ Distance between policeman and thief = 200 – 150 = 50m

128. (c) When time is constant

Then, distance ∝ speed

Police Thief

Speed → 5 : 4

Distance → $\underbrace{5 \quad : \quad 4}$

1 unit → 150

∴ Distance covered by thief = 4 unit

= 150 × 4 = 600 meter.

129. (c) ∵ Time is constant.

ATQ,

Police : Thief

Speed → 10 : 9

Dist. → $\underbrace{10 \quad : \quad 9}_{\text{diff.}}$

1 unit → 200m

9 unit → 1800m

= 1.8 km

∴ Distance covered by thief = 1800m

= 1.8 km

130. (c) Since, time is constant

Dist. ∝ speed

Police : Thief

Speed → 27 : 22

Dist. → $\underbrace{27 \quad : \quad 22}_{\text{diff.}}$

5 unit → 195m

22 unit → 858m

131. (c) Required time = $\frac{\text{Distance}}{\text{Relative Speed}}$

$$=\frac{92}{(104.4-90)\times\frac{5}{18}}=\frac{92\times 180}{144\times 5}=23 \text{ sec}$$

132. (b) Relative speed = 23 – 21 = 2 km/hr

∵ D = S × t

$\Rightarrow 100 = 2 \times \frac{5}{18} \times t$

$\Rightarrow t = 180$ sec

Distance covered by thief

$= 180 \times 21 \times \frac{5}{18} = 1050$ m

Alternate Method:-

∵ Time is constant

Speed ∝ distance

Police : Thief

Speed → 23 : 21

Distance → 23 : 21

2 unit → 100

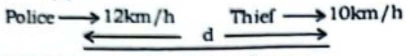
21 → 1050

133. (b) Relative speed = 82 – 64 = 18 km/h

Distance = 1300 m

$\therefore \text{Time} = \frac{1300 \times 18}{18 \times 5} = 260$ sec.

134. (c)

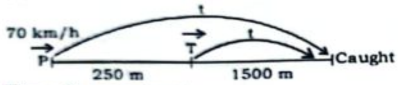


Relative speed = 2 km/hour

Distance = Speed × time

$= 2 \times \frac{5}{18} \times 30 \times 60 = 1000$ m

135. (b)



Time is constant

Distance ∝ Speed

Police Thief

Dis. → 1750 1500

7 : 6

Speed → 7 : 6

$\downarrow \times 10$ $\downarrow \times 10$

70 $\boxed{60\text{km/h}}$

136. (c) ∵ Thief cover 6 km in 30 min.

$\therefore \text{Speed of thief} = \frac{6}{\frac{1}{2}} = 12$ km/hr.

Thief : Policeman

Speed → 4 : 5

$\downarrow \times 3$ $\downarrow \times 3$

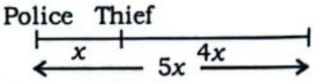
12 km/hr. 15 km/hr.

Relative speed = 3 km/hr.

$\text{Time} = 30 \text{ min.} = \frac{1}{2}$ hr.

$\therefore \text{Distance} = 3 \times \frac{30}{60} = 1.5$ km

Alternate Method:



∵ Time is constant

Speed ∝ distance

Policeman : Thief

Speed/Distance → 5x : 4x

4x → 6 km

x → 1.5 km

137. (c) Relative speed = 120 – 90 = 30km/hr

Time taken by policeman

$= \frac{1.5}{30} = \frac{1}{20}$ hr

∴ Distance at which police catch the thief $= 120 \times \frac{1}{20} = 6$ km

Alternate Method:

∵ Time is constant

Speed ∝ distance

T : P

Speed → 90 km/h 120 km/h

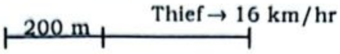
Distance → 3 : 4

diff.

1 unit = 1.5 km

∴ Distance covered by police = 4 unit = 4 × 1.5 = 6 km

138. (c)



Policeman → 20 km/h

Relative speed = (20 – 16)

$= 4 \text{ km/hr} = \frac{4 \times 5}{18} \text{ m/s} = \frac{10}{9} \text{ m/s}$

$\text{Time taken} = \frac{200 \times 9}{10} = 180$ seconds.

∴ Distance covered by thief in 180 seconds $= 180 \times 16 \times \frac{5}{18} = 800$ m

Alternate Method:

Police : Thief

Speed → 20 : 16

Distance → 5 : 4

1 unit → 200 metre

∴ Distance cover by thief = 4 unit = 4 × 200 = 800 m.

139. (b) Distance covered by thief in 30 min $= \frac{30}{60} \times 8 = 4$ km

Relative speed = 12 – 8 = 4 km/hr

Time taken by policeman to catch the thief $= \frac{4}{4} = 1$ hr = 60 minutes

140. (c) Relative speed = (65 – 41) km/hr.

$= 24 \text{ km/hr.} = 24 \times \frac{5}{18} = \frac{20}{3}$ m/s

Time taken by policeman

$= \frac{1200}{\frac{20}{3}} = \frac{1200 \times 3}{20} = 180$ sec. = 3 min.

141. (b) Relative speed = 36 – 18 = 18 km/hr.

Distance = Speed × Time

ATQ,

$500 = \frac{18 \times 5}{18} \times \text{Time} \Rightarrow \text{Time} = 100$ sec.

∴ Time taken by policeman to catch thief = 100 sec.

142. (a) Distance = 280 m

Relative speed = (12 – 7) = 5 km/h

$\text{Time} = \frac{280 \times 18}{5 \times 5 \times 60} = 3\frac{9}{25}$ minutes

143. (b) ∵ Speed of thief = 13.5 km/h

∴ Distance travelled by thief in 36 min (= 8 + 28)

$= \left(13.5 \times \frac{5}{18}\right)$ m/sec × (36 × 60) sec

= 8100 metre

∴ Distance covered by Policeman in 28 min = 8100 – 540 metre = 7560 metre

∴ Speed of Policeman

$= \frac{7560}{28 \times 60} \times \frac{18}{5} = 16.2$ km/h

∴ Time taken by policeman to cover 540 m with relative speed

$= \frac{540 \times 18}{(16.2 - 13.5) \times 5} = \frac{540 \times 18}{2.7 \times 5}$

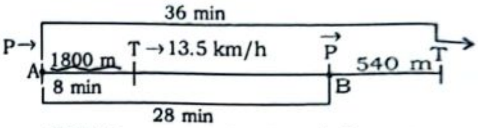
= 720 sec = 12 min

∴ Total time taken by policeman to catch thief = 28 + 12 = 40 min

∴ Distance covered by Police in 40 min

$= \frac{40}{60} \text{ h} \times 16.2 \text{ km/h} = 10.8$ km

Alternate Method:



If thief stop at point B and do not run 540 metre distance then police will catch the thief at B.

⇒ Time taken by thief to cover 540 m

$= \frac{540 \times 18}{13.5 \times 5} = 144 \text{ sec} = 2.4$ min

$\boxed{S \propto \frac{1}{T}}$

Police Thief

T from A to B → 28 36–2.4

28 33.6

5 6

S → 6 5

$\downarrow 2.7$ $\downarrow 2.7$

$\boxed{16.2}$ km/h 13.5 km/h

∴ Time taken by Policeman to cover 540 m distance to catch the thief

$= \frac{540 \times 18}{(16.2 - 13.5) \times 5} = 720\text{sec} = 12$ min

∴ Total time taken by Policeman to catch thief from beginning (from point A) = 28 + 12 = 40 min

∴ Total Distance travelled by policeman to catch thief

$= 16.2 \times \frac{40}{60} = 10.8$ km

144. (d) ATQ,

When time is constant

Distance ∝ Speed

Thief : Policeman

Speed → 11 km/h : 13 km/h

Distance → 11 : 13

Diff.

2 unit → 300 m

1 unit → 150 m

13 unit → 1950 m

∴ Distance covered by police = 1950 m = 1.95 km

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145. (b) Relative distance = 288 m
Relative speed = (42 – 30)m/min
= 12 m/min
Time taken by Inspector to catch the thief $= \frac{288}{12} = 24$ min

146. (a) Relative speed = 9.5 – 6.5
$= 3$ km/h. $= 3 \times \frac{5}{18} = \frac{5}{6}$ m/sec.
$\because$ Time $= \frac{\text{Distance}}{\text{Relative speed}}$
$\therefore$ Time, when policeman nabbed the thief $= \frac{630}{\frac{5}{6}} = \frac{630 \times 6}{5}$ sec.
$\therefore$ Thief covers the distance in
$\frac{630 \times 6}{5}$ sec. $= 6.5 \times \frac{5}{18} \times \frac{630 \times 6}{5}$ meter
= 65 × 21 meter
= 1365 meter ≈ 1.4 km.

147. (c) Relative speed in same direction
= 118.8 – 90 = 28.8 km/h.
$= 28.8 \times \frac{5}{18}$ m/sec. = 8 m/sec.
$\therefore$ Time to catch $= \frac{98}{8} = \frac{49}{4} = 12\frac{1}{4}$ sec.

148. (a) Relative speed in same direction
= 70 – 60 = 10 km/h
$= 10 \times \frac{5}{18} = \frac{25}{9}$ m/sec
$\therefore$ Time $= \frac{500}{\frac{25}{9}} = 180$ sec = 3 min
$\therefore$ Policeman catch the thief in 3 minutes

149. (c) When time is constant
Speed ∝ Distance
Police : Thief
Speed → 10 km/h : 8 km/h
Distance → $\underbrace{10 : 8}_{\text{Diff.}}$
$$\times 4 \left(\begin{array}{l} 2 \text{ unit} \rightarrow 1250 \text{ m} \\ 8 \text{ unit} \longrightarrow 5 \text{ km} \end{array} \right) \times 4$$
$\therefore$ Distance travel by thief is 5 km

150. (a) Relative speed = 8 – 6 = 2 km/h
Time $= \frac{200}{2} \times \frac{18}{5} = 360$ sec = 6 min
Distance travelled by thief in 6 minutes $= 6 \times \frac{5}{18} \times 6 \times 60 = 600$ m

151. (d) When time is constant
Speed ∝ Distance
Police : Thief
Speed → 40 km/h : 32 km/h
Distance → $\underbrace{10 : 8}_{\text{Diff.}}$
$$\left(\begin{array}{l} 2 \text{ unit} \rightarrow 400 \text{ m} \\ \times 4 \qquad\qquad \times 4 \\ 8 \text{ unit} \longrightarrow 1600\text{m} \end{array} \right)$$
$\therefore$ Distance travel by thief is 1600 m

152. (d) When time is constant
Speed ∝ Distance
Police : Thief
Speed → 32 km/h : 25 km/h
Distance → $\underbrace{32 : 25}_{\text{Diff.}}$
7 unit → 210 m
1 unit → 30 m
25 unit → 750 m
Distance travel by the thief is 750 m

Alternate Method:
Time taken by the policeman to catch/overtake the thief
$= \frac{210}{(32 - 25)} \times \frac{18}{5} = 108$sec
$\therefore$ Distance covered by thief before he is over taken $= 108 \times 25 \times \frac{5}{18} = 750$ m

153. (a) $80\% = \frac{4}{5}$
ATQ,
$S_P : S_T = 5 : 4$
Relative speed, 1unit
$= \frac{0.5\text{km}}{12\text{min}} = \frac{0.5}{12} \times 60 = 2.5\text{km/h}$
Speed of thief (S_T) = 4 × 2.5 km/h
= 10km/h

154. (a) When time is constant
Speed ∝ Distance
Police : Thief
Speed → 18 km/h : 16 km/h
Distance → $\underbrace{9 : 8}_{\text{Diff.}}$
$$\times 8 \left(\begin{array}{l} 1 \text{ unit} \rightarrow 400 \text{ m} \\ 8 \text{ unit} \rightarrow 3200 \text{ m} \end{array} \right) \times 8$$

Alternate Method:
Relative speed = 18 – 16 = 2 km/h
Time taken to cover 400 m
$= \frac{400}{2 \times 5} \times 18 = 720$ sec
$\therefore$ Distance travelled by thief in 720 sec
$= 16 \times 720 \times \frac{5}{18} = 3200$ m

155. (d) Time taken to cover 360 m
$= \frac{360\text{m}}{(9.2 - 8)\text{km/h}} = \frac{360}{1.2 \times \frac{5}{18}} = 1080$ sec
$\therefore$ Distance travelled by policeman in 1080 sec.
$= 9.2 \times \frac{5}{18} \times 1080 = 2760$ m

156. (b) Speed of thief = 8 km/h.
Speed of policeman = 10.5 km/h.
Time taken by policeman to cover 1 km
$= \frac{1}{(10.5 - 8)} = \frac{1}{2.5}$ h
$\therefore$ Distance travelled by thief
$= 8 \times \frac{1}{2.5} = 3.2$ km.

157. (d) When time is constant,
Distance ∝ Speed
Thief : Police
Speed → 7 : 8
Distance → $\underbrace{7 : 8}_{\text{Diff.}}$
1 unit → 450 m
8 unit → 3600 m
$\therefore$ Policeman catch thief at 3.6 km

158. (b) Relative speed = $(10 - x)$ km/hr.
ATQ,
$\frac{100 \times 18}{(10 - x) \times 5} = 3 \times 60$
$\Rightarrow 10 - x = 2$
$\Rightarrow x = 8$ km/hr.

159. (c) When time is constant
Speed ∝ Distance
Police : Thief
Speed → 7 m/s : 5 m/s
Distance → $\underbrace{7 : 5}_{\text{Diff.}}$
2 unit → 150 m
1 unit → 75 m
5 unit → 375 m
$\therefore$ Distance travel by thief is 375 m

160. (b) $\because$ R and S travel in opposite direction
Relative speed $= 5\frac{1}{4} + 3 = 8\frac{1}{4}$
Time $= \frac{44}{5\frac{1}{4} + 3} = \frac{44 \times 4}{33} = \frac{16}{3}$ hrs
= 5 hrs 20 min.

161. (b) Relative speed = (12 – 10) km/h
= 2 km/h
$$\begin{tikzcd} 60 \text{ min} \arrow[r] \arrow[d, "\div 10"] & 2000 \text{ m} \arrow[d, "\div 10"] \\ 6 \text{ min} & \boxed{200 \text{ m}} \end{tikzcd}$$
$\therefore$ Distance between them
= 300 – 200 = 100 m

162. (b) Relative speed = 9 – 8 = 1 km/h
Distance covered in 3 minutes at 1 km/h
$= 3 \times 60 \times \frac{5}{18} = 50$ m
$\therefore$ Distance between them after 3 minutes = 300m – 50m = 250 m

163. (b) Distance between police and thief = 200 m
Relative speed = 11 – 10
$= 1\text{km/h} = \frac{5}{18}\text{m/sec}$
Distance covered by them in 6min
$= \frac{5}{18} \times 60 \times 6 = 100$ m
$\therefore$ After 6 minutes distance between them = 200 – 100 = 100 m

164. (d) Relative speed = 21 – 20
$= 1$ km/h. $= \frac{5}{18}$ m/s.
Distance travelled in 18 sec
$= \frac{5}{18} \times 18 = 5$ m.
$\therefore$ Distance between them after 18 sec.
= 80 + 5 = 85 m

165. (b) Speed of thief = 15km/h
Distance covered by thief in 4 min
$= 15 \times \frac{4}{60} = 1$km
ATQ,
After chasing 16 min thief by the police distance between them is 200m.

Now, Relative speed

$= \frac{(1000-200)\text{m}}{16\,\text{min}}$

$= \frac{800}{16\times60}\times\frac{18}{5}$ km/h = 3km/h

Speed of Police = 15 + 3 = 18 km/h

Thief caught by the police at the distance $= 18\times\frac{1}{3} = 6$ km

166. (a) Relative speed = 25 – 15
= 10 km/hr

Distance covered by A in 6 hrs
= 15 × 6 = 90 km

Time taken by B to catch A

$= \frac{90}{10} = 9$ hours

167. (c) Distance travelled by thief till 4 am = 57km.

Relative speed = 76 – 57 = 19 km/hr

Time $= \frac{57}{19} = 3$hour

Thus, at 4am + 3h = 7am owner catch the thief.

168. (d) Distance travelled by thief in 30 minutes

$= 20\times\frac{1}{2} = 10$ km

Distance travelled by policeman in 24 minutes

= 10km – 400m = 9600 m = 9.6 km

Speed of policeman

$= \frac{9600}{24\times60}\times\frac{18}{5} = 24$ km/h

Time taken to cover 400m

$= \frac{400}{24-20} = \frac{400}{4\times5}\times18 = 360$ sec

∴ Distance travelled by policeman in 360 sec.

$= 24\times\frac{360}{3600} = 2.4$ km

∴ Distance from starting point police catch thief at

= 9.6 km + 2.4 km = 12 km.

169. (d) Let, Speed of P = x

Distance travelled by thief in 15 min.

$\Rightarrow 60\times\frac{1}{4} = 15$km

Required time = 9:00 – 8:30 p.m.

$= 30\text{min} = \frac{1}{2}$h

ATQ,

$\Rightarrow \frac{1}{2} = \frac{15}{(P-60)} \Rightarrow 30 = P - 60$

$\Rightarrow$ P = 90 km/hr.

70. (c) Speed of thief = 50 km/hr

Distance travelled by thief till 9 : 30
= 50 × 1.5 hr = 75 km

Relative speed = 65 – 50 =15 km/hr

Time taken to cover 75 km $= \frac{75}{15}$
= 5 hours

∴ Distance travelled by Policeman
= 65 × 5 = 325 km

171. (b)

B ⟶ 10 km/h A ⟶ 4 km/h

When time will be same they will meet

	B	A
Speed	10	4
Distance	10	4
	5	2

3

3 unit → 16

1 unit → $\frac{16}{3}$

5 unit → $\frac{80}{3} = 26.67$ km

Alternate Method:

Speed of A = 4km / h

Speed of B = 10km / h

In 4 hrs A complete the distance of 16 km

B has to cover the difference of 16 km by relative speed

Time taken by B to catch A

$= \frac{16}{10-4} = \frac{16}{6}$hrs

∴ Distance from starting point = speed of B × time

$= \frac{16}{6}\times10 = 26.67$ km

172. (d) Speed of Vivek = 70 km/h

Speed Neeraj = 120 km/h

with speed of 70 km/h Vivek covered the distance in 4 hr = 280 km

Because both are moving in same direction.

then the relative speed
= 120 – 70 = 50 km/h

Time when they meet

$= \frac{280}{50} = 5$ hr 36 min = 5 : 36 p.m.

II. 4 pm Neeraj take time = 4hrs

so in 4 hrs Neeraj cover distance
= 4 × 120 = 480 km

At 4 pm Vivek take time = 8 hrs

So,

In 8 hrs Vivek covers distance
= 8 × 70 = 560 km

Total distance covered by both
= 480 + 560 = 1040 km

Option (d) is correct

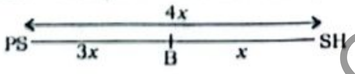
173. (b) Distance covered by thief in 12 min $= 10\times\frac{12}{60} = 2$ km.

Relative speed = (15 – 10) km/hr
= 5 km/hr

Time taken by policeman to catch the thief $= \frac{2}{5}\times60 = 24$ min

∴ Time = 5:12 p.m. + 24 min = 5:36 p.m.

174. (d)



15 min $= \frac{15}{60} = \frac{1}{4}$hrs

Distance covered by police

$= \frac{1}{4}\times16 = 4$ km

$\Rightarrow 4x = 4 \Rightarrow 3x = 3$ km

175. (c) We know,

Time $= \frac{\text{Distance}}{\text{Relative Speed}}$

Time $= \frac{600}{(10-8)\text{km/h}} = \frac{600}{2\times\frac{5}{18}}$

= 1080 sec=18 min

∴ Policeman catch the thief in 18 min

176. (a) Let, Speed of faster car = x

Speed of slower car = y

A ├── 144 km ──┤ B

D = S × T

$\frac{144}{x-y} = 12$h

$\Rightarrow x - y = 12$ ..... (i)

$\frac{144}{x+y} = \frac{9}{8}$

$\Rightarrow x + y = 128$ ..... (ii)

from equation (i) and (ii)

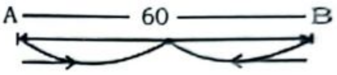
$x = 70$ km

177. (d) Let, Speed of both cars be x and y km/h.

Relative speed in same direction
= $(x - y)$ km/h

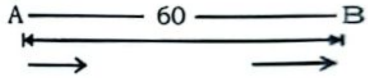
Relative speed in opposite direction
= $(x + y)$ km/h

ATQ,



$\frac{60}{x+y} = \frac{3}{2}$

$\Rightarrow x + y = 40$ ..... (i)



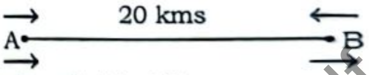
$\frac{60}{x-y} = 6$

$\Rightarrow x - y = 10$ ..... (ii)

To solve (i) and (ii)

$x = 25$ km/h, y = 15 km/h

178. (a)



Let, Speed of A = 'A'

Speed of B = 'B'

Then,

$A - B = \frac{20}{1} = 20$ km/h .....(i)

$A + B = \frac{20\times60}{12} = 100$ km/h .....(ii)

Solve eq. (i) & (ii) we get,

A = 60 km/h, B = 40 km/h

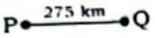
Alternate Method:-

Relative Speed :-		(A – B)		(A + B)
t	→	1		1/5
t	→	5	:	1
Speed	→	1	:	5

$\frac{A}{B} = \frac{3}{2}$

From given options only (a)

$\frac{60}{40} = \frac{3}{2}$

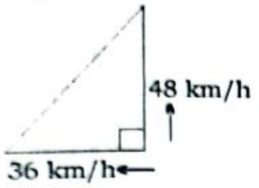
179. (a)


ATQ,

$$\frac{275}{2.5} = (60 + \text{Speed}_Q)$$

$$\Rightarrow \frac{275}{5} \times 2 - 60 = \text{Speed}_Q$$

$$\Rightarrow \text{Speed}_Q = 50 \text{ km/hr}$$

180. (c)


∵ Triplets → 36, 48, 60

Distance covers in 15 sec

$$= 60 \times \frac{5}{18} \times 15\text{m} = 250 \text{ m.}$$

181. (c) ATQ.

$$y - x = \frac{140}{7} = 20 \quad \ldots\ldots \text{(i)}$$

$$y + x = \frac{140}{1} = 140 \quad \ldots\ldots \text{(ii)}$$

From eqn (i) and (ii)

$2y = 160$

$y = 80$ km/hr

182. (c) When they move in opposite direction

$$S_A + S_B = \frac{45}{\frac{27}{60}}$$

$$S_A + S_B = 100 \quad \ldots\ldots \text{(i)}$$

When they move in same direction

$$S_A - S_B = \frac{45}{\frac{9}{2}}$$

$$S_A - S_B = 10 \quad \ldots\ldots \text{(ii)}$$

(i) + (ii)

$$S_A = \frac{110}{2} = 55 \text{ km/h}$$

183. (d) Let, Speed of bus = x

ATQ,

D = S × T

$$\Rightarrow (80 + 40) = 15 \times (75 - x) \times \frac{5}{18}$$

$$\Rightarrow 120 = \frac{15 \times 5}{18}(75 - x)$$

$$\Rightarrow \frac{18 \times 8}{5} = 75 - x \Rightarrow 28.8 = 75 - x$$

$\therefore x = 46.2$ km/h

184. (b) Given,

Speed of bus = 42 km/h

Let the speed of car = x km/h

$$\text{Speed} = \frac{\text{Distance}}{\text{Time Taken}}$$

$$\Rightarrow x - 42 = \frac{90}{3}$$

$$\Rightarrow x = 30 + 42 = 72 \text{ km/h}$$

185. (a) D = S × T

Distance covered by car,

$$= 72 \times \frac{45}{60} = 54 \text{ km}$$

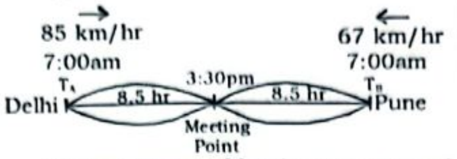
Distance covered by bus,

= 54 – 4.2 – 15.8 = 34 km

When time is constant

Distance ∝ Speed

	Car		Bus
Distance →	54	:	34
Speed →	27	:	17

186. (b)


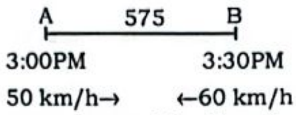
Distance covered by the train started from Delhi = 85 × 8.5

= 722.5 km

Distance covered by the train started from Puna = 67 × 8.5

= 569.5 km

Hence, The distance between Delhi and Puna = 722.5 + 569.5 = 1292 km

187. (b)


Distance covered by Ist train in 30 min = $50 \times \frac{1}{2} = 25$ km

Now,

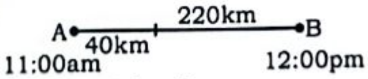
Distance = Relative speed × Time

(575 – 25) = (50 + 60) × t

t = 5 hrs

Distance covered by first train in $\left(5 + \frac{1}{2}\right)$ hrs

$$= 50 \times \frac{11}{2} = 275 \text{ km}$$

188. (d)


Speed (A) = 40 km/h,

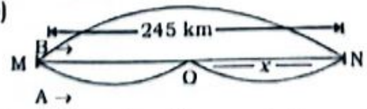
Speed (B) = 30 km/h

Now, distance = (220 – 40) = 180

Time they will meet next day

$$= \frac{180}{(40 - 30)} = \frac{180}{10} = 18 \text{ hr}$$

= 12:00 pm + 18hr = 6:00 am

189. (b)


Given that the distance between M and N = 245 km

Speed of A = 26 km/hr

Speed of B = 65 km/hr

Let, 'x' be the distance between O & N

Since, they meet at point O,

∴ Time taken by both to reach the point O is same.

$$\Rightarrow \frac{245 - x}{26} = \frac{245 + x}{65}$$

$\Rightarrow 65(245 - x) = 26(245 + x)$

$\Rightarrow 5 \times 245 - 5x = 2 \times 245 + 2x$

$\therefore x = 35 \times 3 = 105$ km.

Alternate Method:

Time is constant

Distance ∝ Speed

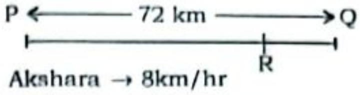
	A	:	B
Speed →	26	:	65
Distance →	2	:	5

Diff.

3 unit

(5 + 2) = 7 unit → 245 km

3 unit → 105 km

190. (c)


Akshara → 8km/hr

Siddharth → 10km/hr

Time taken by Siddharth to reach point Q = $\frac{72}{10}$

= 7.2 hrs.

Distance covered by Akshara in 7.2 hrs. = 8 × 7.2 = 57.6 km

Remaining distance = 72 – 57.6

= 14.4 km

Relative speed = 10 + 8

= 18 km/hr

Time taken by them to cover 14.4 km

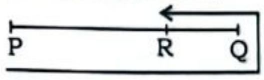
$$= \frac{14.4}{18} = 0.8 \text{ hrs.}$$

Total time = 7.2 hrs + 0.8 hrs

= 8 hrs.

Distance of P to R = 8 × 8 = 64 km

Alternate Method:-



Speed → $\frac{\text{Akshara (PR)}}{4}$: $\frac{\text{(PQ+ RQ)Siddharth}}{5}$

Distance → 4 : 5

1

(RQ + RQ) = 1 unit

$$\therefore RQ = \frac{1}{2} \text{ unit}$$

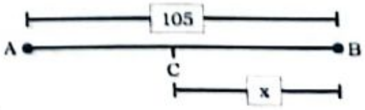
$$PQ = PR + RQ = 4 + \frac{1}{2} = \frac{9}{2} \text{ unit}$$

$$\frac{9}{2} \text{ unit} \to 72 \text{ km}$$

1 unit → 16 km

∴ Distance (PR) = 4 × 16

= 64 km

191. (b)


ATQ,

Distance travelled by Meenu

= 105 – x

Distance travelled by Daya

= 105 + x

Time taken by both is same

$$\Rightarrow \frac{105 - x}{10} = \frac{105 + x}{25}$$

$\Rightarrow 105 \times 5 - 5x = 105 \times 2 + 2x$

$\Rightarrow 105 \times 3 = 7x \Rightarrow x = 45$

$\Rightarrow$ AC = 105 – 45 = 60 km.

Alternate Method:

A : B

Speed → 10 : 25

2 : 5

Distance → 2 : 5

∵ Time is constant

(2 + 5) unit = 105 × 2

Distance between A and C

$= \frac{105 \times 2}{7} \times 2 = 60$ km.

192. (c)

By given condition

Speed of Robin = $\frac{120}{3}$ = 40 km/h

So,

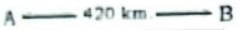
Speed of Sonit = (40 + 80)
= 120 km/hr

(i) Assume time = $\frac{500}{(120-40)} \neq 6$

(ii) Sonit cover distance = 120 × 6
$\neq 600$

Neither (i) nor (ii)

193. (b)



11 a.m　　12 noon

70 km/hr. →　　← 30 km/hr.

Distance covered by train A in 1 hr.
= 70 km.

Remaining distance = 420 – 70
= 350 km.

Since A and B travel in opposite direction

Relative speed = (70 + 30)
= 100 km/hr.

∴ Time = $\frac{350}{100}$ = 3.5 hrs.

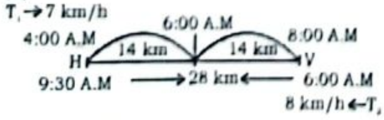
Meeting time = 12 noon + 3.5 hrs.
= 3 : 30 pm.

194. (a) Relative Speed = 36 + 54
= 90 km/hr

$= 90 \times \frac{5}{18} = 25$ m/sec.

∴ Time = $\frac{250}{25}$ = 10 second

195. (c)


$T_1 \rightarrow$ 7 km/h
4:00 A.M
6:00 A.M
8:00 A.M
H
14 km
14 km
V
9:30 A.M
28 km
6:00 A.M
8 km/h ← T_2

Speed = $\frac{\text{Distance}}{\text{Time}}$

Time　Speed

$T_1 \rightarrow$ 4 hour　7　Dist.

28

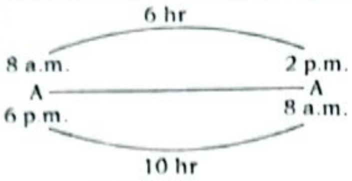
$T_2 \rightarrow$ 3.5 hour　8

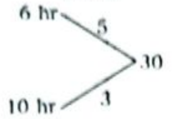
Relative speed = 7 km/h + 8 km/h
= 15 km/h

$T = \frac{28 - 7 \times 2}{15}$ hrs. = $\frac{14}{15}$ hrs. = 56 min

Trains will cross each other at 6:56 AM

196. (a)

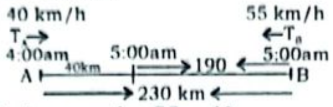

6 hr
8 a.m.
2 p.m.
A
A
6 p.m.
8 a.m.
10 hr


6 hr
5
30
10 hr
3

Total time = $\frac{30}{5+3} \times 60$ minute
= 3 : 45 minute

At time they meet each other
= 8 am + 3 hr 45 minute
= 11 : 45 a.m.

197. (b)


40 km/h
$T_A \rightarrow$
4:00am
40km
5:00am
190
55 km/h
$\leftarrow T_B$
5:00am
A
B
230 km

Relative speed = 55 + 40
= 95 kmph.

∴ Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{230-40}{95}$

$= \frac{190}{95} = 2$ hrs

Meeting time = 5:00 am + 2 hours
= 7:00 am

198. (c) In such a type of question we will make the time of starting the same for both the stations.

Assume, The starting time of station A is 9 am.

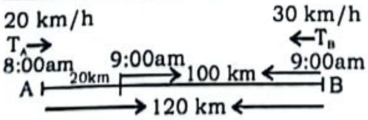
Now, The distance = 120 – 20
= 100 km

Relative speed = 20 + 30 = 50 km/h

Time = $\frac{100}{50}$ = 2 hour

Time of meting = 9 am. + 2 hour
= 11 am.

Alternate Method:-


20 km/h
$T_A \rightarrow$
8:00am
20km
9:00am
100 km
30 km/h
$\leftarrow T_B$
9:00am
A
B
120 km

Relative speed = 20 +30=50 km/h

Time = $\frac{100}{50}$ = 2 hr

Meting time = 9:00am + 2 hr
= 11:00am

199. (c) If the train crosses the another train it means it crosses the length of own as well as the length of the other train

Total distance
= $T_A + T_B$ + Distance difference
= 450 + 300 + 300 = 1050m.

Relative speed adds in opposite direction

Relative speed = $(162 + 108) \times \frac{5}{18}$
= 75m/s

Time = $\frac{\text{Distance}}{\text{Time}}$

Time to cross each other = $\frac{1050}{75}$
= 14 sec.

200. (a) From 8 : 30 to 8 : 54 P travel distan

= 30 km/h × 24 min = 30 × $\frac{24}{60}$ = 12 k

Remaining distance = 181 – 12
= 169 km

Relative Speed = 30 + 35 = 65 km/h

∴ Time = $\frac{169}{65}$ hours = $\frac{13}{5}$

=2 hours 36 minutes

Time when they meet
= 8 : 54 + 2 hrs. 36 min. = 11 : 30 AM

201. (b) Speed of A = 8 km/h

Distance = 8 × 8 = 64 km

Speed of B = 24 km/h

Meeting time = $\frac{\text{Distance}}{\text{Relative Speed}}$

$= \frac{64}{24-8} = \frac{64}{16} = 4$ hour.

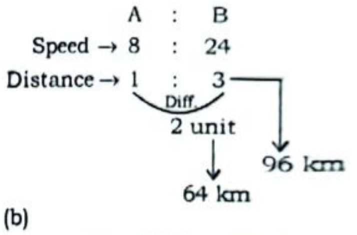
Total Distance cover by B
= 64 km + 8 × 4 = 64 + 32 km
= 96 km

Alternate Method:-

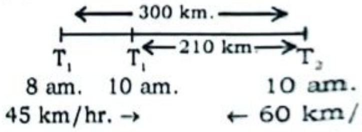
∵ Time is constant

Speed ∝ distance

After 8 hours distance between A and B = 8 × 8 = 64 km


A : B
Speed → 8 : 24
Distance → 1 : 3
Diff.
2 unit
64 km
96 km

202. (b)


300 km.
T_1
T_1
210 km
T_2
8 am.
10 am.
10 am.
45 km/hr. →
← 60 km/hr.

Distance covered by car in 2 hrs.
= 45 × 2 = 90 km.

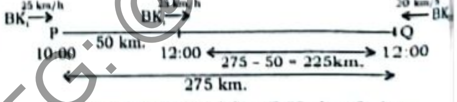
Distance remaining = 300 – 90
= 210 km.

Relative speed = 60 + 45 = 105 km/hr

Time taken = $\frac{210}{105}$ = 2 hrs.

Meeting time = 10 am. + 2 hrs.
= 12:00 pm.

203. (b)


25 km/h
$BK_1 \rightarrow$
25 km/h
$BK_1 \rightarrow$
20 km/h
$\leftarrow BK_2$
P
Q
10:00
50 km.
12:00
275 - 50 - 225km.
12:00
275 km.

Distance covered by BK_1 in 2 hrs.
= 25 × 2 = 50 km

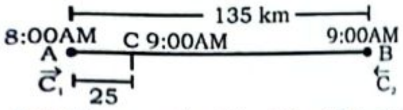
Remaining distance = 275 – 50
= 225 km

Relative speed = 20km/h + 25km/h
= 45km/h

Meeting time = $\frac{225}{20+25} = \frac{225}{45}$ = 5 hr.

Meeting time = 12 : 00 + 5hr
= 5:00 pm

204. (a) Distance covered by A from 8 am to 9 am = 1 × 25 = 25 km



Relative speed = 25 + 30 = 55 km/hr.

Distance = 135 − 25 = 110 km.

⇒ Time = $\frac{110}{55}$ = 2 hrs

∴ Both car will meet = 9am + 2h = 11am

205. (c)

Speed A = 44 km/hr

From 9:30 am to 1:30 pm, Ajit can travel:

44 × 4 = 176 km

Now, Remaining distance

= 416 − 176 = 240 km

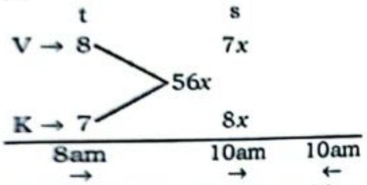
Now,

Time = $\frac{\text{Relative Distance}}{\text{Relative Speed}} = \frac{240}{44+52}$

= 2.5 hrs

⇒ They will meet = 1.30 pm + 2.5 hr = 4 pm

206. (c)



$\overrightarrow{7x \times 2} = 14x$ $\quad D = \overrightarrow{56x} - \overleftarrow{14x} = 42x$

Meeting time = $\frac{42x}{15x}$ = 2 hr. 48 min.

10 am + 2 hr. 48 min. = 12 : 48 pm.

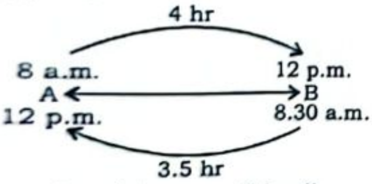
207. (a) Relative speed = 15–10 = 5kmph

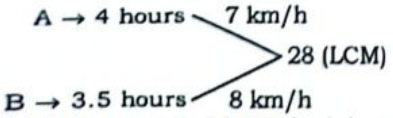
Relative distance = 10 × 3 = 30 km

∴ Required time = $\frac{30}{5}$ = 6 hrs

∴ 8 am + 6 hrs = 2 pm

208. (c) ATQ,





Distance travelled by train A in 30 minute = 7 × $\frac{1}{2}$ hr = 3.5 km

Remaining distance = 28 − 3.5 = 24.5 km

Time = $\frac{24.5}{15}$ × 60 min. = 98 min.

So, The time when they meet each other = 8 : 30 am + 98 min.

= 10 : 08 am

209. (b) If time is same

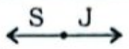
Then, $\frac{S_1}{S_2} = \frac{d_1}{d_2}$

$\frac{75}{100} \Rightarrow \frac{3}{4}\Big\rangle 1 \to 50$

Total Distance = (3 + 4) ×50 = 50 × 7

= 350 km

210. (a)



ATQ,

$D_S + D_J$ = 40 kms

Let, speed of soma = S

∴ Speed of Julie = S + 4

Then,

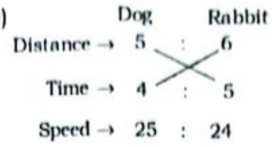
Total dist. = S × 4 + 4 (S + 4) = 40

⇒ S + S + 4 = 10

⇒ S = 3 km/hr

∴ Speed of Julie = 7 km/hr

211. (c)



212. (c)

A B

Distance → 7 : 5

Time → 8 : 6

Speed → 8×5 : 7×6

40 : 42

20 : 21

213. (c) $\frac{\text{Speed of man}}{\text{Speed of bus}} = \frac{(T_1 - T_2)}{T_2}$

T_1 → Time after which bus leaves the terminal

T_2 → Time after it meets with the person

$\frac{50}{x} = \frac{(50-10)}{10} \Rightarrow \frac{50}{x} = \frac{40}{10} \Rightarrow \frac{50}{x} = \frac{4}{1}$

⇒ 4x = 50

∴ x = 12.5 km/h

214. (a) $\frac{S_T}{S_S} = \frac{|T_1 - T_2|}{T_2} \Rightarrow \frac{x}{330} = \frac{0.5}{12.5}$

$x = \frac{330}{25} \times \frac{18}{5} = 47\frac{13}{25}$ km/h

215. (a) Let, Original time = x

Increased time = (x + 3)

ATQ,

$\frac{1000}{x} - \frac{1000}{x+3}$ = 75 km/h

by option, satisfy the value of x

x = 5 hours

216. (d) Given,

Let, Time taken by Y = K hours

and X = K − 5

$\frac{1200}{K-5} - \frac{1200}{K}$ = 40 km/h.

by option, satisfy the value of K.

K = 15 hrs. satisfied.

217. (b) Let, Speed of slow local = S_1 km/h

∴ Speed of fast local = (S_1+10) km/h

Time difference = 45 min

ATQ,

$\frac{150}{S_1} - \frac{150}{S_1+10} = \frac{45}{60}$

By option (b) satisfies the value of S_1

⇒ S_1 = 40 km/h

218. (b) Let the Initial speed = x

A.T.Q.,

$\frac{280}{x-14} - \frac{280}{x}$ = 60 min = 1 hrs

Solving by options

∴ Initial speed = 70 km/h

Alternate Method:

$280 = \frac{S(S-14)}{14} \times \frac{60}{60}$

⇒ 280 × 14 = S(S − 14)

⇒ 70 × 4 × 14 = 70 × 56 = S(S − 14)

⇒ S = 70 km/hr

219. (d) Let, Original speed of bike = x

ATQ,

$\frac{180}{x-8} - \frac{180}{x} = 6$

Go through option, we get,

x = 20 km/h.

220. (a) $\frac{300}{n} - \frac{300}{n+10} = 5$

By Hit and Trial,

n = 20 km/h

n + 10 = 30 km/h

∴ Average speed = $\frac{2 \times 30 \times 20}{30 + 20}$ = 24 km/h

221. (b) Let speed of A = x

speed of B = x − 25

ATQ,

$\frac{250}{x-25} - \frac{300}{x} = 4$

By option

x = 50 km/h (speed of A)

222. (b) Let, Original speed = x km/hr

$\frac{240}{x-8} - \frac{240}{x} = 1$

By hit and trial = x = 48 km/hr

So, time taken to cover 480 km at original speed = $\frac{480}{48}$ = 10 hr.

223. (a) Total distance

= $\frac{22.5}{60} \times 68 + \frac{12}{60} \times 72$

= 25.5 + 14.4 = 39.9 km ≈ 40 km

224. (d) Let, time taken to cover the distance = n

Sum of n-terms of an A.P is given by

Sn = $\frac{n}{2}$ [2a +(n − 1)d]

ATQ,

(60 + 70 + 80 +.....n times) = 1210

⇒ 1210 = $\frac{n}{2}$ [2 × 60 + (n − 1)× 10]

⇒ 1210 = $\frac{n}{2}$ [120 + (n − 1)10]

⇒ 121 = $\frac{n}{2}$ [12 + (n − 1)]

⇒ 242 = n(12 + n −1) ⇒ 242 = n(11 + n)

∴ n = 11

225. (a) Let, Distance = x km

Start time 10:00 am

Final time 11: 25 am

Total time = 1 + $\frac{25}{60} = \frac{17}{12}$h

⇒ $\frac{x}{32} + \frac{15}{60} + \frac{x}{24} = \frac{17}{12}$

⇒ $\frac{x}{32} + \frac{1}{4} + \frac{x}{24} = \frac{17}{12} \Rightarrow \frac{3x + 24 + 4x}{96} = \frac{17}{12}$

⇒ x = 16 km

Total distance = 2x = 2 × 16 = 32 km

226. (c) Total time $= \frac{400}{50} = 8$ hour

Speed in 1st hour $= \frac{200}{2} = 100$ km/h.

Distance in 2nd hour $= \frac{100}{2}$ km/h. × 1

= 50 km.

Remaining distance = 400 − (200 + 50)

= 150 km.

Remaining time = 8 − (2 + 1) = 5

$\therefore$ Speed $= \frac{150}{5} = 30$km/h.

227. (a) Let, Speed of Smita = x km/hr

Speed of Pihu = $14 - x$

ATQ,

$$\frac{48}{x} + \frac{48}{(14-x)} = 28$$

We can also check from options

e.q.n.,

(a) $x = 12$ satisfies the given equation.

speed of Smita = 12 km/hr.

228. (a) Distance = 250 km

ATQ,

Remaining distance $= 250 \times \frac{2}{5}$

= 100 km

He reaches 30 minute early

= 6 hr − 30 minute = 5.5 hr

Remaining time = 5.5 − 3.5 = 2 hr

$\therefore$ Required speed $= \frac{100}{2} = 50$ km/hr

229. (b) Total no of cycle

$$= \frac{\text{Total Distance}}{\text{Perimeter of circle}}$$

$$\Rightarrow n = \frac{3630000 \times \frac{5}{4}\text{hr}}{2 \times \frac{22}{7} \times \frac{7}{2}}$$

$$\Rightarrow n = \frac{3630000 \times 5}{4 \times 22}$$

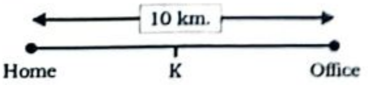
$\therefore n = 206250$

230. (b) Distance $= \frac{S_1S_2}{S_1 - S_2} \times \Delta t$

$$= \frac{20 \times 30}{10} \times \left(\frac{3}{2} + \frac{5}{2}\right) = 240\text{km}$$

231. (d) Walking Jogging Running

Speed 5 10 20



$$T_1 = \frac{5}{5} = 1,\ T_2 = \frac{5}{10} = \frac{1}{2}$$

$$T_3 = \frac{5}{10} = \frac{1}{2},\ T_4 = \frac{5}{20} = \frac{1}{4}$$

$$\text{Avg. speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{20}{1 + \frac{1}{2} + \frac{1}{2} + \frac{1}{4}} = \frac{20}{2 + \frac{1}{4}} = \frac{80}{9}$$

232. (d) ATQ,

$$\left(\frac{5x}{5}\right) + \left(\frac{x}{5}\right) + \left(\frac{4x}{6}\right) = \frac{112}{60}$$

$$\Rightarrow \frac{112x}{60} = \frac{112}{60} \Rightarrow x = 1$$

The total distance $= (5x + 4x + 1x)$

$= 10x$

$= 10 \times 1 = 10$ km

$\therefore$ The total distance (in km) travelled by the person is 10 km.

233. (d) ATQ,

Remaining Distance = 100% − 75%

$= 25\% = \frac{1}{4}$

Time $= 1 - \frac{2}{3} = \frac{1}{3}$hr

$\left[\because S = \frac{D}{T}\right]$ Thus,

$$x = \frac{\frac{1}{4}}{\frac{1}{3}} \times 130\text{km/hr} = \frac{3}{4} \times 130\text{ km/hr}$$

$$\therefore \frac{x}{2} = \frac{390}{4 \times 2} = 48.75$$

234. (d) Speed $= 8\frac{1}{3}$ m/s

$$= \frac{25}{3} \times \frac{18}{5} = 30\text{ km/hr}$$

Remaining distance $= 1 - \frac{2}{3} = \frac{1}{3}$

Remaining time $= 1 - \frac{5}{8} = \frac{3}{8}$

$$\left[S = \frac{D}{T}\right] = \frac{\frac{1}{3}}{\frac{3}{8}} \times 30 = \frac{8}{9} \times 30$$

$$= 26\frac{2}{3}\text{ km/hr}$$

235. (d) Distance → 100 km 270 km

Speed → S S − 5

ATQ,

$$\frac{270}{S} + \frac{36}{60} = \frac{270}{S-5}$$

$$\Rightarrow 270\left(\frac{S - S + 5}{S(S-5)}\right) = \frac{3}{5}$$

$$\Rightarrow \frac{5}{S(S-5)} = \frac{1}{450}$$

$$\Rightarrow \frac{1}{S(S-5)} = \frac{1}{5 \times 450} = \frac{1}{2250}$$

Checking option (d) 50

$$\text{LHS} = \frac{1}{50 \times 45} = \frac{1}{2250} = \text{RHS}$$

236. (c) Distance 75km 90 km

Speed x $x + 10$

$$\frac{75}{x} + \frac{90}{x+10} = 3$$

Put $x = 50$ or solve quadratic equation

$$\frac{75}{50} + \frac{90}{60} = 3$$

3 = 3 (satisfied)

$\therefore$ Time will take to cover 300km

$$= \frac{300}{50} = 6\text{ hour}$$

237. (b) ATQ,

$$\frac{150}{(S-10)} - \frac{150}{S} = \frac{30}{60}$$

Go through by option we get,

S = 60 km/hr

$$\therefore \text{Time} = \frac{90.}{(60-15)} = \frac{90}{45} = 2\text{ hrs}$$

238. (d) Let the speed of A & B be x & y.

ATQ,

$$\frac{40}{x} - \frac{40}{y} = 2\text{ hour} \quad \text{......(i}$$

$$\text{Again, } \frac{80}{2x} - \frac{80}{y} = \frac{3}{2}\text{hour}$$

$$\frac{40}{x} - \frac{80}{y} = \frac{3}{2}\text{ hour} \quad \text{......(ii}$$

From eq. (i) and (ii)-

$$2 + \frac{40}{y} - \frac{80}{y} = \frac{3}{2}$$

$$\frac{-40}{y} = \frac{3}{2} - 2 \Rightarrow \frac{-40}{y} = \frac{-1}{2}$$

y = 80 km/h

Hence, Speed of B = 80km/h

Distance = 120 km

Time taken by B $= \frac{120}{80} = 1\frac{1}{2}$ hours

239. (b) Mohan

↓

Speed → 2 : 3

Time → 3 : 2

Diff.

1 unit → (2 + 1) = 3 hours

3 unit → 9 hours

$\because$ Mohan taken 2 hours more tha Kishore

$\therefore$ Kishore's time = 9 − 2 = 7 hours

240. (b) $40\% = \frac{2}{5}$

Bus Car

Speed → 5 : 7

Also, speed of train $= \frac{1020}{17} \times 2$

= 120 km/hr

⇒ Speed of Bus = 60 km/hr

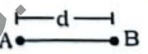
5 unit → 60

7 unit → 84

⇒ Speed of car = 84 km/hr

$\therefore$ Distance $= 84 \times \frac{7}{4} = 147$ km

241. (b)



Total travel time

= (2pm to 7 pm) = 5 hrs

= 5hrs − 1.5 hrs = 3.5 hrs

ATQ,

$$\Rightarrow \frac{d}{4.5} + \frac{d}{6} = 3.5$$

$$\Rightarrow 10.5\,d = 3.5 \times 6 \times 4.5$$

$$\Rightarrow d = \frac{3.5 \times 6 \times 4.5}{10.5} = 9\text{ km}$$

Alternate Method:

Total time = 7pm – 2pm = 5hrs

Actual travel time = 5 – 1.5 = 3.5 hrs

$$\Rightarrow \text{Distance} = \frac{S_1 \times S_2}{S_1 + S_2} \times \text{time}$$

$$= \frac{4.5 \times 6}{10.5} \times \frac{7}{2} = 9 \text{ km.}$$

242. (a) ATQ,

(A) → speed 1 : 2

Time 2 : 1

(2 – 1) = 1 unit → (2.5 hr + 1 hr)

1 unit → 3.5 hr

2 unit → 7 hr

A require 7 hours for walking 40 km

243. (a) Speed of A = a

Speed of B = b

$$\text{ATQ, } \frac{40}{a} - \frac{40}{b} = 2 \text{ .....(i)}$$

Also,

$$\frac{80}{2a} - \frac{80}{b} = \frac{3}{2} \text{ .....(ii)}$$

(i) & (ii)

$$\Rightarrow \frac{40}{b} = 2 - \frac{3}{2}$$

$$\Rightarrow b = 80 \text{ kmph}$$

$$\text{Required time} = \frac{90}{80} = 1\frac{1}{8} \text{hrs}$$

244. (c) $\frac{4}{5}$ of 160 = 128 km

Remaining distance = 32 km

$\frac{2}{3}$ of the time = $\frac{2}{3} \times 15 = 10$ hours

remaining hours = 5 hours

∴ Speed for the remaining distance

$$= \frac{32}{5} = 6.4 \text{ km/hr}$$

245. (c) Let, Total distance = 300 km

Speed = 60km/h

Time = 5 hour

2h 3h

60% of dis 120 km

180 km ↓

$$\text{Speed} = \frac{120}{3} = 40 \text{ km/h}$$

Alternate Method:

Distance is same

Time → 2 : 3

Speed → 3 : 2

$$\underset{60 \text{ km/h}}{\overset{20}{\downarrow}} \qquad \underset{\boxed{40 \text{ km/h}}}{\overset{\times 20}{\downarrow}}$$

246. (a) $30\% = \frac{3}{10}$

When, Distance is same

Train Car

Speed → 13 : 10

Time → 10 : 13

Diff.

3 unit → 30 min

1 unit → 10 min

10 unit → 100 min

So, train actual time = 100 min

$$\text{Speed of train} = \frac{130}{100} \times 60 \text{ km/h}$$

$$= 78 \text{ km/h}$$

247. (a) ATQ,

$y + x = 100$ km/hrs

$$\frac{90}{x} + \frac{90}{y} = \frac{15}{4}$$

$$\left(3 \text{ hrs } 45 \text{ min} = \frac{15}{4} \text{hours}\right)$$

$$\Rightarrow \frac{90 \times 100}{xy} = \frac{15}{4} \Rightarrow xy = 2400$$

$$\Rightarrow xy = 40 \times 60 \Rightarrow x : y = 40 : 60 = 2 : 3$$

248. (c) Let, Distance = D

$$\frac{D}{6} - \left(\frac{D}{8} + \frac{15}{60}\right) = \frac{10}{60}$$

$$\frac{D}{6} - \frac{D}{8} = \frac{25}{60} \text{hr}$$

$$\frac{D}{24} = \frac{25}{60}$$

$$D = \frac{25 \times 24}{60} = 10\text{km}$$

Alternate Method:

$$D = \frac{S_1 \times S_2}{S_1 - S_2} \times \Delta t$$

$$= \frac{6 \times 8}{2} \times \frac{(15 + 10)}{60} = 10 \text{ km}$$

249. (d) Total distance = 20 miles

Time taken by walking both sides

= 6 hrs

⇒ Time taken by walking one side

= 3 hrs

Time taken by riding both ways

= 6 – 2 = 4 hrs.

⇒ Time taken by riding one way

= 2 hrs.

∴ Total time by walking and riding each side = 3 + 2 = 5 hrs.

$$\text{Average Speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{20}{5} = 4 \text{ miles/hr.}$$

SPEED BOOSTER HACKS

◆ Calculating squares from 101 to 130 ◆

Here, Base = 100

Let N = 100 + x

Then $N^2 = (N + x)/x^2$

Note:- Here, x^2 is to be written in 2 digit.

Ex: (i) $(108)^2 = (108 + 8)/8^2 = 11664$

(ii) $(103)^2 = (103 + 3)/3^2 = 10609$

(iii) $(116)^2 = (116 + 16)/16^2 = 132\overset{+}{/}256 = 13456$

(iv) $(123)^2 = (123 + 23)/23^2 = 146\overset{+}{/}529 = 15129$

◆ Do it Yourself ◆

(i) $(107)^2$ = ...

(ii) $(111)^2$ = ...

(iii) $(117)^2$ = ...

(iv) $(121)^2$ = ...

(v) $(124)^2$ = ...

(vi) $(127)^2$ = ...

15
Chapter

RACE & CIRCULAR MOTION

◆ TYPE – I ◆
CONCEPT OF LINEAR RACE

1. In a 1500 m race, Anil beats Bakul by 150 m and in the same race Bakul beats Charles by 75 m. By what distance does Anil beat Charles?
SSC CGL 01/12/2022 (Shift-01)
(a) 217.50 m (b) 200.15 m
(c) 293.50 m (d) 313.75 m

2. In a 1500-m race, if A beats B by 100 m and B beats C by 150 m, then by what distance (in m) does A beat C?
SSC CHSL 03/06/2022 (Shift-2)
(a) 140 (b) 150
(c) 100 (d) 240

3. A can beat B in a 100-metre race by 10 metres. B can beat C in a 100-metre race by 10 metres. What is the ratio ($t_A : t_B : t_C$), which are the respective times taken by A, B and C to complete the race?
SSC MTS 07/07/2022 (Shift-1)
(a) 100 : 90 : 81 (b) 90 : 81 : 100
(c) 100 : 81 : 90 (d) 81 : 90 : 100

4. In a linear race of 500 m, A can beat B by 50 m and in a race of 600 m, B can beat C by 60 m. By how many metres will A beat C in a race of 400 m?
SSC CGL 08/12/2022 (Shift-03)
(a) 70 (b) 68
(c) 76 (d) 72

5. In a 1400 m race John reaches the finish point in 1 min 6 sec, while James reaches the finish point in 77 sec. By how much distance does John beat James?
SSC Phase X 03/08/2022 (Shift-02)
(a) 240 m (b) 220 m
(c) 180 m (d) 200 m

6. In a 400-metre race, A runs at a speed of 16 m/sec. If A gives B a start of 15 metres and still beats him by 10 sec, then what is the speed of B?
SSC CGL 02/12/2022 (Shift-02)
(a) 11 m/sec (b) 10 m/sec
(c) 13 m/sec (d) 9 m/sec

7. Tarun gives Hari a head-start of 60 seconds in a 2400 m race and still beats him by 40 seconds. If the speed of Hari is 6 m/s find the speed of Tarun.
SSC CHSL TIER-II (18/11/2024)
(a) 8.5m/s (b) 8 m/s
(c) 7 m/s (d) 7.5 m/s

8. In a 2 km linear race, if P completes the race in 200 seconds and Q in 220 seconds, then the distance by which P beats Q is:
SSC CHSL 09/07/2024 (Shift-01)
(a) $167\frac{6}{11}$ meters
(b) $173\frac{7}{11}$ meters
(c) $191\frac{7}{11}$ meters
(d) $181\frac{9}{11}$ meters

9. In a 100-m race, A beats B by 20 m and B beats C by 5 m. In the same race, find the distance by which A beats C.
SSC CHSL 04/07/2024 (Shift-05)
(a) 22 m (b) 24 m
(c) 26 m (d) 25 m

10. In a race of 400 m, Bhim gave Saral a head start by 20 m at the start of the race. Saral took 48 seconds to complete the race. What was the speed (in m/s) of Bhim if Saral defeated Bhim by a margin of 2 seconds?
SSC Phase XII 26/06/2024 (Shift-02)
(a) 8 (b) 8.7
(c) 7.6 (d) 7.4

11. In a 3000 m race, if vehicle A gives vehicle B a start of 400 m, then vehicle A wins the race by 10 sec. If vehicle A gives vehicle B a start of 750 m, then the race ends in a dead heat. How long does vehicle A take to run 3000 m?
SSC Phase XII 21/06/2024 (Shift-01)
(a) 90.5 s (b) 100 s
(c) 64.3 s (d) 92.5 s

12. In a 1200 m race, Rakesh reaches the final point in 36 seconds and Rajesh reaches in 40 sec. By how much distance does Rakesh beat Rajesh?
SSC CPO 05/10/2023 (Shift-03)
(a) 150 m (b) 140 m
(c) 130 m (d) 120 m

13. In a 5 km race, S gave a 500 m head start to T. If they finished the race at the same time and the speed of T is 13.5 km/h, the speed of S is:
SSC CHSL 02/08/2023 Shift-03
(a) 15 km/h (b) 20 km/h
(c) 17.5 km/h (d) 16.5 km/h

14. In a linear race of 1000 m, Prakash beats Ved by 280 m, while Ved beats Rahul by 100 m. By how many metres does Prakash beat Rahul, in the same race?
SSC CHSL 08/08/2023 Shift-03
(a) 376 (b) 350
(c) 352 (d) 348

15. In a 140 m race. Pankaj runs at a speed of $\frac{5}{2}$ m/s. He gives a start of 20 m to Arun and still defeats him by 4 seconds. The speed of Arun is:
SSC CHSL 10/08/2023 (Shift-04)
(a) 1.75 m/s (b) 1.25 m/s
(c) 2 m/s (d) 1.5 m/s

16. Savitha and Parnika decided to ran a 2250 m long race on a track as long as the length of the race. But Savitha gave Parnika a 396 m head start and also allowed her to start 9 seconds before Savitha started running. Parnika ran at 6 m/s and Savitha caught up with Parnika 250 seconds after Savitha started running. What was Savitha's speed (in m/s) during the race?
SSC CHSL 11/08/2023 (Shift-04)
(a) 7.2 m/s (b) 7.8 m/s
(c) 8 m/s (d) 7.5 m/s

17. In a 120 metre race, P beats S by 6 metres. If S starts with a head start of 7.5 metres and it is a 100 metre race, then who wins the race and how many metres? (correct to 2 decimal places)
SSC CHSL 14/08/2023 (Shift-1)
(a) S, 2.63 (b) P, 3.63
(c) S, 3.63 (d) P, 2.63

18. In a 1500 meter race, X beats Y by 100 meter and X beats Z by 240 meter. By what distance does Y beat Z in the same race?
SSC CGL 18/07/2023 (Shift-03)
(a) 160 m (b) 140 m
(c) 150 m (d) 200 m

19. In a 1170 m race, Raman reaches the final point in 65 seconds and Mohan reaches the final point in 90 seconds. By how much distance does Raman beat Mohan?
SSC CGL 19/07/2023 (Shift-01)
(a) 325 m (b) 300 m
(c) 375 m (d) 350 m

20. Ashok runs $2\frac{2}{3}$ times as fast as Bharat. If Ashok gives Bharat a head start of 160 m, then how far must the winning post be so that Ashok and Bharat can reach it at the same time?
SSC CGL 19/07/2023 (Shift-04)
(a) 225 m (b) 256 m
(c) 240 m (d) 200 m

21. P gives Q a head-start of 2 seconds in a 400 m race, but both finish the race at the same time. Find the time taken by P to finish the race if the speed of Q is 2 m/sec.
SSC CGL 20/07/2023 (Shift-03)
(a) 198 sec. (b) 199 sec.
(c) 200 sec. (d) 195 sec.

22. In a 1610 m race, Amarjeet reaches the final point in 91 seconds and Dinesh reaches the final point in 115 seconds. By how much distance does Amarjeet beat Dinesh?

SSC Phase-XI 30/06/2023 (Shift-03)

(a) 326m (b) 340m
(c) 336m (d) 330m

23. In a 1200 m race, bike A beats bike B by 100 m. Bike B beats bike C by 100 m in a 600 m race. If bike A beats bike C by 30 sec in a 720 m race, then what is the speed of bike C?

SSC CGL 03/12/2022 (Shift- 01)

(a) $\frac{17}{3}$ m / sec (b) $\frac{26}{9}$ m / sec
(c) $\frac{17}{9}$ m / sec (d) $\frac{26}{3}$ m / sec

24. A gives B a head-start of 10 seconds in a 1500 m race and both finish the race at the same time. What is the time taken by A (in minutes) to finish the race if speed of B is 6 m/s?

SSC CPO 11/11/2022 (Shift-02)

(a) 3 (b) 4
(c) 8 (d) 5

25. A can run 250 m in 25 sec and B in 30 sec. How many metres start can A give to B in a 1 km race so that the race may end in a dead-heat?

SSC CPO 11/11/2022 (Shift-03)

(a) 169.53 m (b) 173.82 m
(c) 166.67 m (d) 186.34 m

26. Rahul runs a race of 100 meters at a speed of 6 km/hr. Rahul gives a lead of 4 meters to Bharat and still beats him by 4 seconds. Find the speed of Bharat.

Higher Secondary 01/08/2022 (Shift- 01)

(a) 4.5 km/h (b) 4.9 km/h
(c) 5.8 km/h (d) 5.4 km/h

27. Geeta runs $\frac{5}{2}$ times as fast as Babita. In a race, if Geeta gives a lead of 40 m to Babita, find the distance from the starting point where both of them will meet (correct up to two decimal places).

SSC CPO 10/11/2022 (Shift-01)

(a) 66.67 m (b) 65 m
(c) 65.33 m (d) 66 m

28. Rakesh runs $\frac{4}{3}$ times as fast as Mukesh. In a race, if Rakesh gives a lead of 60 m to Mukesh, find the distance from the starting point where both of them will meet.

SSC CHSL 25/05/2022 (Shift- 01)

(a) 232 m (b) 240 m
(c) 264 m (d) 255 m

29. In an 800 m race, the ratio of the speeds of two contestants Ankur and Neha is 5 : 6. If Ankur has a head-start of 200 m, then Ankur will win by ______.

SSC CHSL 03/07/2024 (Shift-03)

(a) 89m (b) 80m
(c) 76m (d) 69m

30. Reema runs $\frac{5}{4}$ times as fast as Rekha. In view of this Reema allows Rekha a lead of 50 metres to Rekha in a friendly race competition. What is the distance from the starting point where both Reema and Rekha meet?

SSC CPO 03/10/2023 (Shift-02)

(a) 200 m (b) 225 m
(c) 240 m (d) 250 m

31. Two runners run at the speed of 100 m/min and 120 m/min respectively. If the second runner takes 10 minutes less to complete the race than the first runner, what is the length of the race?

SSC CGL 03/03/2020 (Shift- 02)

(a) 6 km (b) 4 km
(c) 1 km (d) 2 km

32. In a 1500 m race, if vehicle P gives vehicle Q a start of 200 m, then vehicle P wins the race by 8 sec. Alternatively, if vehicle P gives vehicle Q a start of 400 m, the race ends in a dead heat. How long does vehicle P take to run 1500 m?

SSC CGL 07/12/2022 (Shift-01)

(a) 44 sec (b) 45 sec
(c) 40 sec (d) 60 sec

33. Atul gives Vishu a head-start of 20 seconds in a 900 m race and beats him by 135 m. While running the same race again Atul gives a start of 189 m and beats him by 8 seconds. In how much time can Vishu complete the full race of 900 m?

SSC CGL 11/09/2024 (Shift-01)

(a) 3 minutes 30 seconds
(b) 2 minutes 50 seconds
(c) 3 minutes 20 seconds
(d) 3 minutes 10 seconds

34. Arun and Bhaskar run a race of 3 km. First, Arun gives Bhaskar a head start of 400 m and beats him by 30 seconds. While coming back, Arun gives Bhaskar a lead of 2.5 minutes and gets beaten by 500 m. What is the difference between the times in minutes in which Arun and Bhaskar can run the race for one side separately?

SSC CHSL 04/07/2024 (Shift-02)

(a) 3 min (b) 1.5 min
(c) 2.5 min (d) 2 min

35. In a 150-m race, if R gets a 5-metre head start, then he would beat S by 35 metres. If S gets a 25-metre head start in a 100 metre race, then who would win the race and by how many metres?

SSC Phase XII 20/06/2024 (Shift-03)

(a) R = 5.44 (b) S = 5.44
(c) S = 4.44 (d) R = 4.44

36. In a 200 meter linear race, if A gives B a start of 25 meter, then A wins the race by 10 seconds. Alternatively, if A gives B a start of 45 meter, the race ends in a dead heat. How long does A take to run 200 meter ?

SSC SSC 24/07/2023 (Shift-03)

(a) 78 sec (b) 77 sec
(c) 78.5 sec (d) 77.5 sec

37. In a 1000 m race, Arjun, Balaji and Charan are running. Arjun beats Balaji by 100 m, and Balaji beats Charan by 100 m. In the next 1000 m race (the speeds are the same as in the previous), Balaji gives Charan a head start of 100 m, and Arjun gives Balaji a head start of 100 m. Find the distance by which the winner is ahead of the person just behind him.

SSC CGL 13/12/2022 (Shift-01)

(a) 100 m (b) 40 m
(c) 30 m (d) 20 m

38. Farhan and Aman are going from Delhi to Haryana. The difference in their speeds and the sum of their speeds are 40 km/hr and 60 km/hr respectively. If Farhan can complete this race 8 minutes before Aman, then find the distance that both should cover.

SSC CHSL 21/03/2023 (Shift-01)

(a) $\frac{5}{3}$ km (b) $\frac{8}{3}$ km
(c) $\frac{3}{5}$ km (d) $\frac{3}{8}$ km

39. P and Q take part in 400 m race. P runs at 12 km/hr. P gives Q a start of 20 m and still beats him by 13 seconds. The speed of Q is: (Round up to two decimal places.)

SSC CGL TIER-II (20/01/2025)

(a) 11.38 km/hr (b) 10.29 km/hr
(c) 11.61 km/hr (d) 10.87 km/hr

◆ TYPE – II ◆

CONCEPT OF CIRCULAR RACE

40. Ali and Badal start from the same position and at the same time in a 1200 m circular race, with speeds of 27 km/h and 45 km/h, respectively. Find after how much time they will meet again on the track for the first time when they are both running in the same direction.

SSC CHSL 01/06/2022 (Shift-02)

(a) 280 seconds (b) 240 seconds
(c) 250 seconds (d) 220 seconds

41. In a circular race of 1600 m, A and B start from the same point and at the same time with speeds of 27 km/h and 45 km/h, respectively. After how long will they meet again for the first time on the track when they are running in the same direction?

SSC CGL 21/07/2023 (Shift-03)

(a) 90 sec (b) 320 sec
(c) 240 sec (d) 180 sec

42. Sohan and Amit started a car race from the same point in the same direction and at the same time on a circular track of length 1125 m with speeds of 36 km/h and 54 km/h, respectively. After how much time (in seconds) will they meet for the first time since the start of the race?

SSC CGL 27/07/2023 (Shift-01)

(a) 220 (b) 215
(c) 210 (d) 225

43. Three persons P, Q, R run along a circular track at speeds of 3 km/h, 4 km/h, 6 km/h, respectively. If the length of the track is 36 km, then after how much time will they meet again at the starting point?

SSC CPO 10/11/2022 (Shift-02)

(a) 38 hours (b) 36 hours
(c) 24 hours (d) 28 hours

44. In a race around a circular cycling track of 75 km, two cyclists are riding at a speed of 30 km/h and 25 km/h. After what time (in hours) will they meet at the point from where they started their journey?

SSC CGL 14/07/2023 (Shift-02)

(a) 16 (b) 7
(c) 14 (d) 15

45. Anjali and Babita are running on a circular track in opposite directions at same time from same point with speeds of 8 m/sec and 6 m/sec, respectively. If the length of the circular track is 960 m, how many times distinct points they will meet?

SSC CHSL 09/06/2022 (Shift- 03)

(a) 7 times (b) 6 times
(c) 12 times (d) 14 times

46. Two persons started running on a circular track at a speed of 20 m/s and 30 m/s in opposite directions. If the circumference of the circular track is 100 m, find at how many distinct points they will cross each other?

SSC CGL 19/07/2023 (Shift-03)

(a) 2 (b) 3
(c) 5 (d) 10

47. Two friends P and Q simultaneously start running from same point around a circular track. They run in the same direction. P runs at 6 m/sec and Q runs at b m/sec. If they cross each other at exactly two points on the circular track and b is a natural number less than 6, then how many values can b take?

SSC CGL 14/07/2023 (Shift-03)

(a) 2 (b) 1
(c) 4 (d) 3

48. A, B and C run simultaneously, starting from a point, around a circular track of length 1200m, at respective speeds of 2m/s, 4m/s and 6m/s. A and B run in the same direction, while C runs in the opposite direction to the other two. After how much time will they meet for the first time?

SSC CGL 17/07/2023 (Shift-02)

(a) 10 minutes (b) 9 minutes
(c) 12 minutes (d) 11 minutes

49. Racer A and racer B run a race of 18 km on a circular track of length 800 m. Both complete one round in 200 sec and 250 sec, respectively. After how much time from the start will the faster person meet the slower person for the last time?

SSC CGL 17/07/2023 (Shift-04)

(a) 2700 sec (b) 4000 sec
(c) 2250 sec (d) 1800 sec

50. Having started from the same point and at the same time, two runners P and Q are running around a circular track of length 500m in opposite directions with the speeds of 6 m/s and 10m/s, respectively. If they exchange their speeds after meeting for the first time, who will reach the starting point first?

SSC CGL 25/07/2023 (Shift-04)

(a) Q (b) P
(c) Both P and Q will reach at the same time
(d) No one of the P and Q

51. Joy and Kat run around a circular track of length 1100 m in opposite directions with initial speed of 6 m/sec and 4 m/sec, respectively. Starting from the same point whenever they meet, Joy's speed halves and Kat's speed doubles. After how much time from the beginning will they meet for the second time?

SSC Phase X 05/08/2022 (Shift-03)

(a) 220 sec (b) 210 sec
(c) 190 sec (d) 200 sec

52. In a circular race of 840 m, A and B start running in the same direction at the same time from the same point at the speeds of 6 m/s and 12 m/s, respectively. After how much time will they meet next?

SSC CGL 09/09/2024 (Shift-01)

(a) 140 sec (b) 20 sec
(c) 40 sec (d) 70 sec

53. Varun and Sandeep started for a car race from the same point, in the same direction and at the same time on a circular track of length 1635 m with the speeds of 90 km/h and 108 km/h, respectively. After how much time (in sec) will they meet again for the first time?

SSC CGL 09/09/2024 (Shift-02)

(a) 324 (b) 325
(c) 327 (d) 326

54. In a circular race of 750 m, X and Y start from the same point and at the same time with speeds of 9 km/h and 13.5 km/h, respectively. If they are running in the same direction then, when will they meet again for the first time on the track?

SSC CGL 10/09/2024 (Shift-01)

(a) 750 sec. (b) 900 sec.
(c) 500 sec. (d) 600 sec.

55. M and N walk along a circular track. They start at 5:00 a.m. from the same point in the opposite directions. M and N walk at a speed of 5 rounds per hour and 2 rounds per hour, respectively. How many times will they cross each other before 6.30 a.m. on the same day?

SSC CGL 12/09/2024 (Shift-01)

(a) 10 (b) 3
(c) 5 (d) 7

56. P and Q start running in opposite directions on a circular track from the same point. If their speeds are 10 m/s and 8 m/s, respectively, then after what time will they meet if the length of the track is 1620 m?

SSC CGL 13/09/2024 (Shift-02)

(a) 110 sec. (b) 70 sec.
(c) 120 sec. (d) 90 sec.

57. Arvind and Chetan started running simultaneously from the same point in the same direction on a circular track of length 210 m. If Arvind takes 180 seconds to complete one round, and Chetan takes 420 seconds to complete one round, after how much time will they meet for the first time at the starting point on the track?

SSC CGL 17/09/2024 (Shift-03)

(a) 10 minutes (b) 15 minutes
(c) 21 minutes (d) 28 minutes

58. In a circular race of 4800m, A and B start from the same point and at the same time with speeds of 36 km/h and 54 km/h. When will they meet again for the first time on the track if they are running in the opposite direction?

SSC CGL 18/09/2024 (Shift-02)

(a) 200 second (b) 205 second
(c) 178 second (d) 192 second

59. Seema walks around a circular field at the rate of 3 rounds per hour, while Priya runs around it at the rate of 8 rounds per hour. They start in the same direction from the same point at 11:54 p.m. They shall first cross each other at?

SSC CGL 25/09/2024 (Shift-03)

(a) 12:06 p.m. (b) 12:00 a.m.
(c) 12:06 a.m. (d) 11:59 p.m.

60. Two athletes are participating in a race on a circular track of 220 m. Ravi runs at the speed of 22 m/s, while Kapil runs at the speed of 11 m/s. They start from the same point, at the same time and in the same direction. After how many seconds will they meet for the first time?

SSC CGL 26/09/2024 (Shift-01)

(a) 15 sec. (b) 16 sec.
(c) 20 sec. (d) 24 sec.

61. In a circular race of 1600 m in length, Bhaskar and Vinay start with speeds of 27 km/h and 45 km/h starting at the same time from the same point. When will they meet for the first time on the track when running in the opposite directions and the same direction, respectively?

SSC CGL 26/09/2024 (Shift-03)

(a) 1 min 20 sec, 5 min 20 sec
(b) 1 min 40 sec, 5 min 20 sec
(c) 2 min 40 sec, 5 min 40 sec
(d) 2 min 20 sec, 4 min 20 sec

62. In a circular race of 950 m length, A and B start with speeds of 18 km/h and 36 km/h, respectively, in the same direction, at the same time, from the same point. After how many seconds will they meet for the first time at the starting point?

SSC Phase XII 24/06/2024 (Shift-02)

(a) 195 (b) 190
(c) 90 (d) 95

63. In a circular race of 840 m, A and B start running in the same direction at the same time from the same point at the speeds of 6 m/s and 12 m/s, respectively. After how much time will they meet next?

SSC Phase XII 25/06/2024 (Shift-02)

(a) 70 s (b) 20 s
(c) 140 s (d) 40 s

64. In a circular race of 2,500m, Reeta and Geeta start running in the same direction from the same point and at the same time with speeds of 36 km/h and 54 km/h, respectively. After how much time will they meet for the first time on the track?

SSC Phase XII 25/06/2024 (Shift-04)

(a) 480 Second (b) 500 Second
(c) 490 Second (d) 510 Second

65. A and B are participating in a 1,800 m circular race. A is running at a speed of 24 km/h and B is running at a speed of 15 km/h. If both start from the same point and at the same time and run in the same direction, find the time when they will meet again. (up to two decimal points)

SSC Phase XII 26/06/2024 (Shift-02)

(a) 400 sec. (b) 500 sec.
(c) 720 sec. (d) 600 sec.

66. In a circular path of 619 m, Preeti and Rani start walking in opposite directions from the same point at the speed of 2.85 km/h and 5.4 km/h, respectively. When they will meet for the first time approximately?

SSC Phase XII 20/06/2024 (Shift-01)

(a) After 6.75 minutes
(b) After 4.75 minutes
(c) After 6.05 minutes
(d) After 4.50 minutes

67. Two people A and B started running from the same point on a circular track of length 400 m in opposite directions with initial speeds of 10 m/s and 40 m/s, respectively. Whenever they meet, A's speed doubles and B's speed halves. After what time from the start will they meet for the third time?

SSC CHSL 09/08/2023 Shift-04

(a) 30 sec (b) 24 sec
(c) 26 sec (d) 28 sec

68. Raju and Sohan started a car race from the same point, in the same direction and at the same circular track of length 1725 m with speeds of 72 km/h. and 90 km/h, respectively. After how much time (in seconds) will they meet again for the first time?

SSC CHSL 14/08/2023 (Shift-4)

(a) 345 seconds (b) 335 seconds
(c) 340 seconds (d) 350 seconds

69. A and B are running on a circular track of length 1400 metres. The speed of A is 33 m/sec and the speed of B is 47 m/sec. They start from the same point at the same time in the opposite direction. After how much time will they meet for the second time?

SSC CHSL 17/08/2023 (Shift-2)

(a) 33 sec (b) 38 sec
(c) 35 sec (d) 32 sec

70. On a circular path of 693 km, Sujata and Anjali start walking from the same point but in the opposite directions at the speed of 2.85 km/h and 1.5 m/sec, respectively. When they will meet for the first time?

SSC CGL 17/07/2023 (Shift-01)

(a) After 6.75 min.
(b) After 6.05 min.
(c) After 5.04 min.
(d) After 4.56 min.

71. In a circular race of 4225 meter, X and Y start from the same point and at the same time at speeds of 54 km/h and 63 km/h. When will they meet again for the first time on the track when they are running in the opposite direction?

SSC CGL 24/07/2023 (Shift-02)

(a) 140 sec. (b) 150 sec.
(c) 130 sec. (d) 120 sec.

72. Ram and Shyam are racing along a circular track. The speed of Ram is thrice the speed of Shyam. The length of the circular track is 1440 meter. After the start of the race from the same point simultaneously, Ram meets Shyam for the first time at the end of the 8th minute. If Ram and Shyam start the race again from the same starting point simultaneously, then the time taken by Shyam to finish the race is: (given that the length of the race is same as the length of the track)

SSC CGL 26/07/2023 (Shift-02)

(a) 7.5 min (b) 16 min
(c) 30 min (d) 22.5 min

73. In a circular path of 600 m, Pankaj and Rohit start walking in opposite directions from the same point at the speeds of 2.85 m/s and 5.4 km/h, respectively. After how many minutes will they meet for the first time? (Rounded off to one decimal point)

SSC CGL 27/07/2023 (Shift-03)

(a) 3.2 (b) 2.3
(c) 2.7 (d) 4.7

74. In a circular race along a track of length 3600 m, X and Y run at speeds of 27 km/h and 45 km/h, respectively. Suppose they start at the same time and in the same direction, when will they meet again at the starting point?

SSC Phase XI 27/06/2023 (Shift-01)

(a) 1440 sec (b) 720 sec
(c) 2200 sec (d) 1200 sec

75. In a race of 1200 m on a circular track, A and B start from the same place at the same time in the same direction with speeds of 18km/h and 27km/h respectively. How long after the start of the race will they meet for the first time on the track?

SSC CHSL TIER - II 26/06/2023

(a) 240 sec (b) 520 sec
(c) 300 sec (d) 480 sec

76. A and B run a 12 km race on a circular track of length 1200 m. They complete one round in 300 seconds and 400 seconds respectively. After how much time from start will the faster person meet the slower person for the last time?

SSC CPO 10/11/2022 (Shift-03)

(a) 2400 sec (b) 8400 sec
(c) 9600 sec (d) 10800 sec

77. A and B run on a circular path of perimeter 1200 m at different speeds. If they start at the same time and from the same place, but run in opposite directions, they meet for the first time in 3 minutes. If the speed of B is 10.8 km/hr, then what is the speed (in km/hr) of A.?

SSC PHASE IX 2022

(a) 13.2 (b) 12.5
(c) 12.8 (d) 13.5

78. On a 2200 m long circular track, Sarita and Kavita drove their cycles from the same point but in opposite direction with the speeds 20 km/hr and 16 km/hr, respectively. After how much time will they meet again for the first time?

SSC CGL TIER-II (18/01/2025)

(a) 2 minutes 20 seconds
(b) 3 minutes 20 seconds
(c) 2 minutes 50 seconds
(d) 3 minutes 40 seconds

ANSWER KEY

1.	(a)	2.	(d)	3.	(d)	4.	(c)	5.	(d)	6.	(a)	7.	(b)	8.	(d)	9.	(b)	10.	(a)
11.	(c)	12.	(d)	13.	(a)	14.	(c)	15.	(c)	16.	(b)	17.	(a)	18.	(c)	19.	(a)	20.	(b)
21.	(a)	22.	(c)	23.	(a)	24.	(b)	25.	(c)	26.	(d)	27.	(a)	28.	(b)	29.	(b)	30.	(d)
31.	(a)	32.	(a)	33.	(c)	34.	(b)	35.	(b)	36.	(d)	37.	(d)	38.	(a)	39.	(b)	40.	(b)
41.	(b)	42.	(d)	43.	(b)	44.	(d)	45.	(a)	46.	(c)	47.	(b)	48.	(a)	49.	(b)	50.	(c)
51.	(b)	52.	(a)	53.	(c)	54.	(d)	55.	(a)	56.	(d)	57.	(c)	58.	(d)	59.	(c)	60.	(c)
61.	(a)	62.	(b)	63.	(c)	64.	(b)	65.	(c)	66.	(d)	67.	(c)	68.	(a)	69.	(c)	70.	(c)
71.	(c)	72.	(b)	73.	(b)	74.	(b)	75.	(d)	76.	(a)	77.	(a)	78.	(d)				

Chapter - 15 : Race & Circular Motion

SOLUTIONS

1. (a)

A : B : C   A : B : C

1500 : 1350 → 10 : 9 : 9

1500 : 1425 → 20 : 20 : 19

200 : 180 : 171

×7.5   ×7.5

1500   1282.5

diff.

217.5m

2. (d)

A : B : C   A : B : C

1500 : 1400 → 15 : 14 : 14

1500 : 1350 → 10 : 10 : 9

150 : 140 : 126

×10   ×10

1500   1260

diff.

240m

3. (d)

A : B : C   A : B : C

100 : 90 → 10 : 9 : 9

100 : 90 → 10 : 10 : 9

D/S → 100 : 90 : 81

t → 90 × 81 : 100 × 81 : 100 × 90

81 : 90 : 100

Alternate Method:

We can directly tell by options

We know that speed of A > B > C

So, time taken will be in reserve order

⇒ A < B < C.

∴ Option (d) is correct.

4. (c) A : B : C   A : B : C

500 : 450 → 10 : 9 : 9

600 : 540 → 10 : 10 : 9

100 : 90 : 81

×4   ×4

400   324

diff.

76m

5. (d) Speed $\propto \frac{1}{\text{Time}}$ (Distance constant)

Since, time is constant

∴ Speed ∝ Distance

John   James

66 : 77

Time → 6 : 7

Speed → 7 : 6

Dis. → 7 : 6

diff.

1unit = 200m

1400m

6. (a) Time of A = $\frac{\text{Distance}}{\text{Speed}} = \frac{400}{16}$ =25sec

A : B

Distance → 400 : 385

Time → 25 : 35

Speed of B = $\frac{385}{35}$ = 11 m/s

7. (b) Time taken by Hari = $\frac{2400}{6}$

= 400 seconds

Time taken by Tarun

= 400 – 60 – 40 = 300 sec

∴ Speed of Tarun = $\frac{2400}{300}$ = 8 m/s

8. (d)

P : Q

Time → 200 : 220

= 10 : 11

Distance/Speed → 11 : 10

1 unit = $\frac{2000}{11}$

2000 $\boxed{= 181\frac{9}{11} \text{ Meters}}$

9. (b)

A : B : C   A : B : C

100 : 80 → 5 : 4 : 4

100 : 95   20 : 20 : 19

100 : 80 : 76

Diff.

24 m

A beats C by 24m.

10. (a)

Bhim : Saral

Distance → 400 : 380

Time → 50s : 48s

Speed of Bhim = $\frac{400}{50}$ m/s = 8 m/s

11. (c)

A	B	
3000	2600	10sec
– 3000	2250	0
0	350	10

Speed of B = $\frac{350}{10}$ = 35 m/sec

A   B

3000 : 2250

Distance → 4 : 3   [∵ Time is constant]

Speed → 4 : 3   [∴ Distance ∝ Speed]

↓   ↓

$\frac{35}{3} \times 4$ 35

$= \frac{140}{3}$

∴ Time of A = $\frac{3000 \times 3}{140}$ = 64.3 sec

12. (d) Distance covered by Rajesh in 36 sec = $\frac{1200}{40} \times 36$ = 1080 mtr.

∴ Rakesh beat Rajesh by 1200 – 1080 = 120 m

Alternate Method:

Rakesh   Rajesh

36 : 40

Time → 9 : 10

Distance → 10 : 9

1 unit → 120 m

1200

13. (a) S : T

5000 : 4500

10 : 9

×1.5   ×1.5

15 : 13.5

14. (c)

P : V : R   P : V : R

1000 : 720 → 25 : 18 : 18

1000 : 900 → 10 : 10 : 9

250 : 180 : 162

×4   ×4

1000   648

diff.

352m

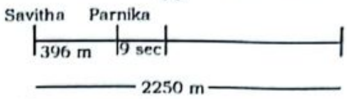
15. (c) Pankaj completes the race in

$= \frac{140}{\frac{5}{2}}$ = 56 sec

Arun completes (140 – 20)m distance in 56 + 4 = 60 sec

Speed of Arun = $\frac{120}{60}$ = 2 m/sec

16. (b)



Parnika covers distance in 9 sec = 9 × 6 = 54m

Total startup distance of Parnika

= 396 + 54 = 450 m

Distance covered by Parnika in 250 sec = 6× 250 = 1500 m

∴Shavita's speed = $\frac{450+1500}{250} = \frac{1950}{250}$ m/s

= 7.8 m/sec

17. (a) Since P beats S by 6 meters in a 120 meter race

So, In 100 m race P beats S by 5 meters.

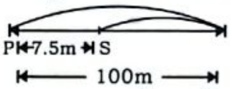
Speed ∝ Distance

P   S

Distance → 100   95

20 : 19

Speed → 20 : 19



P   S

Distance → 100   92.5

Speed → 20   19

Time → $\frac{100}{20}$ $\frac{92.5}{19}$

5   4.87

Diff.=0.13

It is clear that S will win the race

Required distance = 0.13 × 20

= 2.6 m

18. (c) Z : Y : X

1260 : 1400 : 1500

diff.

140

Y beats Z by = $\frac{140}{1400}$ × 1500

= 150m

19. (a) Mohan's speed = $\frac{1170}{90}$ = 13m/sec

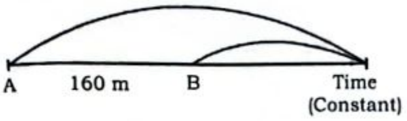
Raman beats Mohan by (90 – 65)

= 25sec

Raman beats Mohan by

= 25 sec × 13 m/sec = 325 m

20. (b)



$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Speed ∝ Distance (Time constant)

Ashok Bharat

Speed → 8 : 3

Distance → $\underbrace{8 : 3}_{\text{diff.}}$

5 unit = 160m

8 unit = 256m

21. (a) Time taken by Q to cover 400m

$$\text{distance} = \frac{400}{2} = 200 \text{ sec}$$

So, time taken by P to cover 400 meter = 200 – 2 = 198 sec

22. (c) Distance

$$= \frac{\text{Total distance}}{\text{Time taken by Dinesh}} \times \text{time difference}$$

$$= \frac{1610}{115} \times 24 = 336 \text{ m}$$

23. (a)

A : B : C   A : B : C

1200 : 1100   → 12 : 11 : 11

600 : 500 → 6 : 6 : 5

72 : 66 : 55

×10   ×10

$\underbrace{720 \quad 550}_{\text{diff.}}$

170m

C cover 170m in 30 sec.

$$\therefore \text{ C's Speed} = \frac{170}{30} = \frac{17}{3} \text{ m/sec.}$$

24. (b) Given,

Distance = 1500 m

Speed of B = 6 m/s

Time taken by B to complete the race

$$= \frac{1500}{6} = 250 \text{ sec}$$

Time taken by A to complete the race = 250 – 10 = 240 sec = 4 min

A will take 4 minutes to complete the race.

25. (c) If d is constant,

$$\Rightarrow \frac{S_A}{S_B} = \frac{t_B}{t_A} = \frac{30}{25} = \frac{6}{5}$$

If T is constant

$$\Rightarrow \frac{d_A}{d_B} = \frac{S_A}{S_B} = \frac{6}{5}$$

To end race at dead-heat in 1 km race A has to give start of B

$$= \frac{1}{6} \times 1000\text{m} = 166.67\text{m}$$

Alternate Method:-

A $\xrightarrow{25\text{sec}}$ 250 m

B $\xrightarrow{25\text{sec}}$ $\frac{250}{30} \times 25 = 208.33\text{m}$

For dead heat-

A give a start to B for 41.67m in 250m race

Similarly, A give a start to B in 1 km race = 41.67 × 4 = 166.68 m

26. (d) $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

Distance = 100m

$$\text{Speed of Rahul} = 6 \times \frac{5}{18} = \frac{5}{3} \text{ m/sec}$$

$$\text{Time taken by Rahul} = \frac{100}{\frac{5}{3}} = 60 \text{ sec}$$

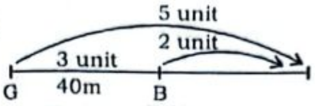
Rahul gives a lead of 4 meters to Bharat and still beats him by 4 seconds. It means Bharat covers the distance of 96 meters in 64 seconds

∴ Bharat's speed

$$= \frac{96}{64} \text{ m/s} = \frac{96}{64} \times \frac{18}{5} \text{ km/h}$$

= 5.4 km/h

27. (a)



Geeta : Babita

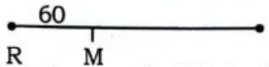
Speed → 5 : 2

Distance → $\underbrace{5 : 2}_{\text{diff.}}$ [Time is constant]

3 unit = 40

$$5 \text{ unit} = \frac{40}{3} \times 5 = 66.67\text{m}$$

28. (b) $\frac{\text{Speed of Rakesh}}{\text{Speed of Mukesh}} = \frac{4}{3}$



Let the speed of Rakesh be 4 and that of Mukesh be 3 then relative speed is (4 – 3) = 1 ms^{-1}.

With 1ms^{-1}, 60 m is covered in 60s.

In 60s, Rakesh will cover 60 × 4 = 240 m.

So, they will meet at a point 240 m from Rakesh.

29. (b)

Ankur : Neha

Speed → 5 : 6

Distance → 600 : 800

$$t_A = \frac{600}{5} = 120 \text{ seconds}$$

Distance covered by Neha in 120 seconds = 120 × 6 = 720 m

Ankur will win by (800 – 720) = 80m

30. (d)

Reema : Rekha

Speed → 5 : 4

Distance → $\underbrace{5 : 4}_{\text{diff.}}$

1 unit = 50

5 unit = 250m

31. (a) Speed → 5 : 6

Time → $\underbrace{6 : 5}_{\text{Diff.}}$

1 unit → 10

6 unit → 60

Distance = 100 × 60 = 6000 meter = 6 km

32. (a) **Case-I:**

P : Q

Distance → 1500 : 1300

Time → t : t + 8

Case-II:

P : Q

Distance → 1500 : 1100

Time → t : t

$$\Rightarrow \frac{1300}{t+8} = \frac{1100}{t}$$

⇒ 13t = 11t + 88

⇒ t = 44 seconds

33. (c) **Case-I:**

Atul : Vishu

Time → x : $x + 20$

Distance → 900 : 900 – 135 = 765

Case-II:

Atul : Vishu

Time → x : $x + 8$

Distance → 900 : 900 – 189 = 711

In 12 sec. = 54m

2 sec. = 9m

200 sec. = 900m

∴ Vishu completed the full race of 900m in 200 sec. or 3 min 20 sec.

34. (b) **Case-I:**

Arun : Bhaskar

Dis. → 3000 : 2600

Time → t min. : t + 0.5 min

∵ 3000 unit → t min.

$$\therefore 2500 \text{ unit} \rightarrow \frac{t}{3000} \times 2500$$

$$= \frac{5t}{6} \text{ min.}$$

Case-II:

Arun : Bhaskar

Dis. → 2500 : 3000

$$\text{Time} \rightarrow \frac{5t}{6} : \frac{5t}{6} + 2.5$$

ATQ,

Speed of bhaskar in case I = Speed of bhaskar in case II

$$\frac{2600}{t+0.5} = \frac{3000}{\frac{5}{6}t+2.5}$$

$$\Rightarrow \frac{13}{t+0.5} = \frac{15\times6}{5t+15}$$

$$\Rightarrow \frac{13}{t+0.5} = \frac{3\times6}{t+3} \Rightarrow 13t + 39 = 18t + 9$$

⇒ 5t = 30 ⇒ t = 6

∴ Diff. between the time to run for

$$\text{one side} = \frac{5t}{6} + 2.5 - t$$

$$= \frac{5\times6}{6} + 2.5 - 6 = 1.5 \text{ min.}$$

35. (b) $\overline{\quad l_1 = 150\text{m} \quad}$

S ← 5m → R ←— 145m —→

R S

Distance → 145m 150 – 35 = 115m

29 23

Speed → 29 23 (∵ time is constant ∴ speed ∝ distance)

$\overline{\quad l_2 = 100\text{m} \quad}$

R ← 25m → S ←— 75m —→

∵ $\text{Speed}_R : \text{Speed}_S = 29 : 23$

$29x : 23x$

$$\text{Time taken by R to cover 100m} = \frac{100}{29x}$$

$$\text{Time taken by S to cover 75m} = \frac{75}{23x}$$

$$\because \frac{100}{29x} > \frac{75}{23x}$$

$\therefore$ S will win the race

Let, S will win the race by 'y' m.

$$\therefore \frac{75}{23x} = \frac{100 - y}{29x}$$

$$\left(\because \text{Time} = \frac{\text{Distance}}{\text{Speed}}\right)$$

$\Rightarrow \frac{75}{23} = \frac{100 - y}{29}$

$\Rightarrow 2175 = 2300 - 23y$

$\Rightarrow 23y = 125$

$\Rightarrow y = 5.44$ m

36. (d) **Case-I:**

$$\begin{array}{lccc} & A & : & B \\ \text{Distance} \rightarrow & 200 & : & 175 \\ \text{Time} \rightarrow & t & : & t + 10 \end{array}$$

Case-II:

$$\begin{array}{lccc} & A & : & B \\ \text{Distance} \rightarrow & 200 & : & 155 \\ \text{Time} \rightarrow & t & : & t \end{array}$$

$\Rightarrow \frac{175}{t+10} = \frac{155}{t}$

$\Rightarrow 175t = 155t + 1550$

$\Rightarrow t = 77.5$ seconds

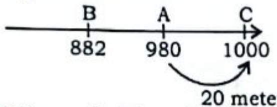
37. (d)

$$\begin{array}{lccccccccc} & A & : & B & : & C & & A & : & B & : & C \\ & 1000 & : & 900 & & & \rightarrow & 10 & : & 9 & : & 9 \\ & & & 1000 & : & 900 & \rightarrow & 10 & : & 10 & : & 9 \\ & & & & & \text{Speed} & \rightarrow & 100 & & 90 & & 81 \end{array}$$

$$\begin{array}{lccccc} \text{Distance} \rightarrow & 1000 & : & 900 & : & 800 \\ \text{Time} \rightarrow & \frac{1000}{100} & : & \frac{900}{90} & : & \frac{800}{81} \\ & = 10\text{sec} & : & 10\text{sec} & : & 9.8\text{sec} \end{array}$$

$D_B = 90 \times 9.8 = 882$

$D_A = 100 \times 9.8 = 980$



Winner is 20m ahead of the person just behind him.

38. (a) Let, speed of Farhan = x km/h and speed of Aman = y km/h

ATQ,

$(x + y) = 60$ km/h ....(i)

$(x - y) = 40$ km/h ....(ii)

Adding equation (i) and equation (ii)

$x = 50$ km/h, Time = $\frac{D}{50}$ h

And y = 10 km/h $\Rightarrow$ time = $\frac{D}{10}$ h

Difference of time = $\frac{8}{60}$

$\frac{D}{10} - \frac{D}{50} = \frac{8}{60} \Rightarrow D = \frac{5}{3}$ km

Alternate Method:

Let, speed of Farhan = x km/h.

Speed of Aman = y km/h.

Relative Speed

Opposite direction $\rightarrow x + y = 60$ km/h.

Same direction $\rightarrow x - y = 40$ km/h.

$x = 50$

$y = 10$

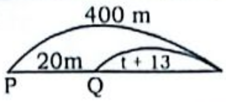
$$\begin{array}{lccc} & x & : & y \\ \text{Speed} \rightarrow & 50 & : & 10 \\ \text{Time} \rightarrow & \underbrace{1 \quad : \quad 5}_{\text{Diff.}} \end{array}$$

4 unit $\rightarrow$ 8 minute

1 unit $\rightarrow$ 2 minute

Distance = $\frac{50}{60} \times 2 = \frac{5}{3}$ km

39. (b)



Time taken by P(t) = $\frac{400 \times 18}{12 \times 5} = 120$

traveled distance = 400 − 20 = 380

time taken by = t + 13 = 120 + 13 = 133

Speed of Q = $\frac{380\text{m}}{133} = \frac{380}{133} \times \frac{18}{5}$

= 10.28 km/h

40. (b) Relative speed = 45 − 27 = 18 km/hr

$$T = \frac{\text{Distance}}{\text{Speed}} = \frac{1200}{18 \times \frac{5}{18}} = 240 \text{ sec}$$

41. (b) Relative speed = 45 − 27 = 18 km/hr

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{1600}{18 \times \frac{5}{18}} = 320 \text{ sec}$$

42. (d) Relative speed = 54 − 36 = 18 km/hr

$$\text{Time} = \frac{1125}{18 \times \frac{5}{18}} = 225 \text{ sec}$$

43. (b) $T_P = \frac{36}{3} = 12\text{h} \Rightarrow T_Q = \frac{36}{4} = 9\text{h}$

$T_R = \frac{36}{6} = 6\text{h}$

L.C.M of 12, 9, 6 = 36 hrs.

44. (d) Time = $\frac{\text{Distance}}{\text{Speed}} \Rightarrow T_1 = \frac{75}{30} = \frac{5}{2}$ hrs

$T_2 = \frac{75}{25} = 3$ hrs

L.C.M. = $\frac{5}{2}, 3 = \frac{\text{L.C.M }(5,\ 3)}{\text{H.C.F }(2,\ 1)} = \frac{15}{1} = 15$

Time = 15 hrs.

45. (a) Speed $\rightarrow$ 8 : 6

$$\overset{\curvearrowleft}{4} \quad \overset{+}{:} \quad \overset{\curvearrowright}{3}$$

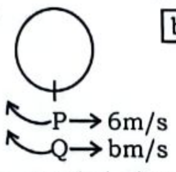
7 Times they meet

46. (c) Speed $\rightarrow$ 20 : 30

$$\overset{\curvearrowleft}{2} \quad \overset{+}{:} \quad \overset{\curvearrowright}{3}$$

5 Times they meet

47. (b)



$\boxed{b<6}$

Keep in mind, If two person running on a circular track in same direction we take the difference of simplest ratio's of the speed to find the number of distinct point they will meet.

Ratio of speed of P and Q = 6 : b

b = 1, 2, 3, 4, 5

As per question they meet 2 times-

We can take ratios are -

6 : 1 Difference of simplest ratio = 5

6 : 2 Difference of simplest ratio = 2

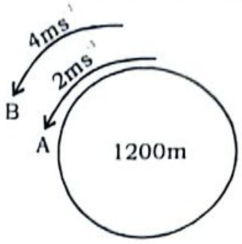
6 : 3 Difference of simplest ratio = 1

6 : 4 Difference of simplest ratio = 1

6 : 5 Difference of simplest ratio = 1

$\therefore$ Only one possible value.

48. (a)



$T_{A+B} = \frac{1200}{2} = 600\text{s}$

$T_{A+C} = \frac{1200}{8} = 150\text{s}$

$\therefore$ L.C.M (600, 150)

= 600 sec = $\frac{600}{60}$ = 10 min

49. (b) Length of Race

= 18 km = 18000m

Length of track = 800m

Number of rounds to complete the race

= $\frac{18000}{800} = \frac{45}{2}$ rounds

ATQ,

A completes 1 round in 200 sec

To complete $\left(\frac{45}{2}\right)$ round, A will take the time

= $\frac{45}{2} \times 200 = 4500$ sec

Now,

When A and B both start running first meet will take place in

= L.C.M of (200, 250) = 1000 sec

Thus, last meeting(i.e. 4th) will take place at = 4000 sec

For the next meeting time would be 5000 sec, which is impossible as A complete the race in 4500 second.

50. (c) Distance = Speed × Time

$\Rightarrow 500 = (10 + 6) \times \text{time}$

$\Rightarrow \text{Time} = \frac{500}{16} = \frac{125}{4} = 31.25$ sec.

Dist. covered by P = 6 × 31.25 = 187.5m

Dist. covered by Q = 10 × 31.25

= 312.5m

If speeds of P and Q are exchanged then.

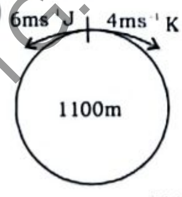
Time of P = $\frac{312.5}{10}$ = 31.25 sec

Time of Q = $\frac{187.5}{6}$ = 31.25 sec

Here, the time is same

So, P and Q reach the starting point at the same time.

51. (b)

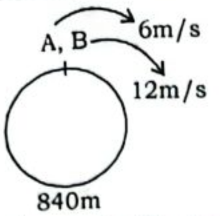


1st Meeting (t) = $\frac{1100}{10}$ = 110 sec

2nd Meeting (t) = $\frac{1100}{(3+8)}$ = 100 sec

Total time = 110 + 100 = 210 sec.

52. (a)



Relative speed = 12 – 6 = 6 m/s

$T_{A\cdot B} = \frac{\text{Track length}}{\text{Relative speed}} = \frac{840}{6}$

= 140 sec.

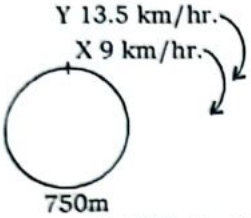
53. (c) Relative Speed = (108 – 90)

$= 18 \text{ km/hr} = 18 \times \frac{5}{18} \text{ m/s} = 5\text{m/s}$

$T_{\cdot\cdot} = \frac{\text{Track length}}{\text{Relative Speed}} = \frac{1635}{5}$

= 327 sec.

54. (d)



Relative speed = 13.5 – 9 = 4.5 km/hr.

$= 4.5 \times \frac{5}{18} = 1.25 \text{ m/s}$

$T_{X\cdot Y} = \frac{\text{Track length}}{\text{Relative speed}} = \frac{750}{1.25} = 600 \text{ sec.}$

55. (a) Since directions are opposite:
Relative speed = 5 + 2 = 7 rounds per hour
∴ From 5:00 am to 6:30 am
Number of rounds = 7 + 3.5 = 10.5
⇒ They will cross each other '10' times.

Alternate Method:-

M N
Speed → 5 : 2

Since, direction is opposite.
∴ They cross each other in one hour (n) = 5 + 2 = 7
∴ 1.5 hour → 7 × 1.5 = 10.5 ≈ 10
∴They will cross each other '10' times.

56. (d) Required time = $\frac{\text{Distance}}{\text{Relative speed}}$

$= \frac{1620}{(10+8)} = \frac{1620}{18} = 90 \text{ sec.}$

57. (c) Time taken by Arvind to complete 1 round = 180 sec.
Time taken by Chetan to complete 1 round = 420 sec.
∴ Time taken by them to meet at starting point for the first time
= LCM (180 sec, 420 sec.) = 1260 sec.
= 21 min.

58. (d) Given,

A B
Speed → 36 km/hr 54 km/hr
Relative speed = 36 + 54
= 90 km/hr

$\Rightarrow \text{Required time} = \frac{4800}{90 \times 5} \times 18$

= 192 sec

59. (c) Speed of Seema = $\frac{1}{20}$ round/min.

Speed of Priya = $\frac{2}{15}$ round/min.

$T_{s\cdot p} = \frac{\text{Distance}}{\text{Relative speed}} = \frac{1}{\frac{2}{15} - \frac{1}{20}}$

$= \frac{1}{\frac{8}{60} - \frac{3}{60}} = \frac{60}{5} = 12 \text{ min.}$

∴ Time = 11:54 p.m + 12 min.
= 12 : 06 a.m.

Alternate Method:-

Speed of Seema = 3 round/hour
Speed of Priya = 8 round/hour
Distance = 1 round
∵ same direction

∴ $\text{Time}_{s\cdot p} = \frac{1}{(8-3)} = \frac{1}{5}$ hour = 12 minute

∴ Time = 11:54 p.m + 12 min.
= 12 : 06 a.m.

60. (c) Length of track = 220 m
Relative speed = 22 – 11 = 11 m/s

Time = $\frac{220}{11}$ = 20 seconds.

61. (a) Given,
Distance = 1600 m
Relative speed in opposite direction
= 27 + 45 = 72 km/h
They meet, when running opposite

direction = $\frac{1600}{72 \times \frac{5}{18}}$ = 80 sec

=1 min 20 sec
Relative speed in same direction
= 45 – 27 = 18 km/h
They meet, when running same

direction = $\frac{1600}{18 \times \frac{5}{18}}$ = 320 sec

= 5 min 20 sec

62. (b) Relative speed when moving in same direction = 36 – 18 = 18 km/h

∴ Time = $\frac{\text{Distance}}{\text{Speed}}$

$= \frac{950}{18 \times \frac{5}{18}} = 190 \text{ sec}$

63. (c) Relative speed when moving in same direction = 12 – 6 = 6 m/s

Speed = $\frac{\text{Distance}}{\text{Time}}$

$\Rightarrow 6 = \frac{840}{T} \Rightarrow T = \frac{840}{6} = 140 \text{ sec}$

64. (b) Relative speed when moving in same direction

$= (54 - 36) \times \frac{5}{18} \text{ m/s} = 5\text{m/s}$

Relative speed = $\frac{\text{Distance}}{\text{Time}}$

$\Rightarrow 5 = \frac{2500}{T}$

⇒ T = 500 sec

65. (c) Distance = 1800 meter
Relative speed when moving in same direction = (24 – 15)km/h

$= 9 \text{ km/h} = 9 \times \frac{5}{18} \text{ m/s} = \frac{5}{2} \text{m/s}$

Meeting time = $\frac{1800 \times 2}{5}$ = 720 sec

66. (d)Distance = 619
Relative speed in opposite direction = (2.85 + 5.4) km/h.

$= 8.25 \times \frac{5}{18} \text{ m/s}$

∵ Time = $\frac{\text{Distance}}{\text{Speed}}$

$= \frac{619 \times 18}{8.25 \times 5 \times 60} = 4.5 \text{ min.}$

67. (c) Relative speed of A and B
= 10 + 40 = 50 m/sec

I^{st} meeting time = $\frac{400}{50}$ = 8 sec

Now, speed of A = 10 × 2 = 20 m/sec

Speed of B = $\frac{40}{2}$ = 20 m/sec

IInd meeting time = $\frac{400}{40}$ = 10 sec

Now, speed of A = 20 × 2 = 40 m/sec

Speed of B = $\frac{20}{2}$ = 10 m/sec

IIIrd meeting time = $\frac{400}{40+10}$ = 8 sec

Time taken by them till third meeting
= 8 + 10 + 8 = 26 sec

68. (a) Relative speed in same direction
= 90 – 72 = 18 km/h = 5 m/sec
They meet first time after

$= \frac{1725}{5} = 345 \text{ seconds}$

69. (c) Relative speed = 33 + 47 = 80 m/sec
Time when they meet for second time

$= \frac{1400}{80} \times 2 = \frac{280}{8} = 35 \text{ sec.}$

70. (c) 2.85 km/hr = 2.58 × $\frac{5}{18}$ m/s = 0.792 m/s
Relative speed = 1.5 + 0.792 = 2.292 m/s

Meeting time = $\frac{693}{2.292}$ = 301.9 sec

= 5.04 min after

71. (c) Relative speed = 63 + 54 = 117 km/hr.
They will meet again for the first time

in = $\frac{4225}{117} \times \frac{18}{5}$ = 130sec

72. (b)

Ram : Shyam

Speed → $3x$: x

Time $= \frac{1440}{(3x - x)}$

$\Rightarrow 8 \times 60 = \frac{1440}{2x} \Rightarrow x = \frac{3}{2}$

Time taken by Shyam

$= \frac{1440}{3} \times \frac{2}{60} = 16$ minutes

73. (b) Speed of Pankaj = 2.85 m/s

Speed of Rohit = 5.4 km/h

$= 5.4 \times \frac{5}{18} = 1.5$ m/sec

Relative speed = 2.85 + 1.5

= 4.35 m/sec

They will meet for the first time in

$= \frac{\text{Circular Path}}{\text{Relative Speed}} = \frac{600}{4.3} \times \frac{1}{60}$

= 2.3 min

74. (b) Given,

Total length of track = 3600 m

They both travel in same direction so relative speed = 45 – 27 = 18 km/h

$\therefore$ Meeting time $= \frac{3600 \times 18}{18 \times 5} = 720$ sec.

75. (d) Relative speed of A and B

= 27 – 18 = 9km/h.

$= 9 \times \frac{5}{18}$ m / sec. $= \frac{5}{2}$ m / sec.

Distance = 1200 m.

$\therefore$ Meeting point $= \frac{1200}{\frac{5}{2}} = 480$ sec.

76. (a) Total length of the race is 12 km

= 12000 m

Track Length = 1200 m

Number of rounds to complete the race $= \frac{12000}{1200} = 10$

The race will be finished by A in

= 300 × 10 = 3000 seconds

Now, when both of them start running

A and B will meet first time

= LCM (300, 400)

= 1200 seconds

A and B will meet second time

= 2400 seconds

For next meet,

Time would be 3600 seconds, which is not possible as A complete the race in 3000 seconds.

Hence, Both of them will meet last time at 2400 seconds.

77. (a) Distance = Speed × Time

Speed of B $= 10.8 \times \frac{5}{18} = 3$ m/s

Distance travelled by B in 3 minutes

= 3 × 180 = 540m.

Remaining distance = 1200 – 540

= 660 m

$\therefore$ Speed of A $= \frac{660}{3 \times 60} \times \frac{18}{5}$

= 13.2 km/h.

78. (d) Both meet again

$= \frac{2200 \times 18}{(20 + 16) \times 5} = \frac{2200 \times 18}{36 \times 5}$

= 220 sec

= 3 min 40 sec

SELECTION मंत्र #05

"How to avoid social media"

#Hacks:-

☞ **Use App Blockers:**

- Install apps like Forest, Freedom, Stay focussed, or App Block to block social media during study hours.
- Set daily limits for social media usage.

☞ **Keep Your Phone Away:**

- **Silent Mode / Airplane Mode:** Reduce distractions by muting notifications.
- **Keep it in Another Room:** Out of sight, out of mind!

☞ **Schedule Social Media Time:**

- Allocate fixed time slots (e.g., 30 minutes in the evening) to check social media.
- Use it as a reward after completing a study goal.

☞ **Track Your Usage:**

- Use digital well-being tools (available on most phones) to monitor how much time you spend on social media.
- Seeing the time wasted can push you to reduce usage.

☞ **Keep Your Goal in Mind:**

- Stick a motivational quote near your study area.
- Remind yourself: "Will this help me crack my exam?" before opening any app.

16
Chapter

TRAIN

◆ TYPE – I ◆
TRAIN PASSING A TELEGRAM POLE, BRIDGE, OR PLATFORM

1. The time taken by a 180 m long train running at a speed of 54 km/h to cross a man standing on the platform is:
SSC CHSL 25/05/2022 (Shift- 02)
(a) 10 Second (b) 12 Second
(c) 11 Second (d) 9 Second

2. A girl walking at a speed of 9 km/h crosses a bridge in 45 minutes. Find the length of the bridge in metres.
SSC CHSL 05/07/2024 (Shift-01)
(a) 7532 (b) 6398
(c) 6750 (d) 6349

3. A goods train 350 m long passes through a tunnel of length 1250 m in 80 seconds. What is the speed of the train?
SSC CGL MAINS 07/03/2023
(a) 64 km/h (b) 56 km/h
(c) 78 km/h (d) 72 km/h

4. Length of a train is 330 metres and it is moving at the speed of 72 km/hr. In how much time will it takes cross a platform of length 710 metres?
SSC CGL MAINS (08/08/2022)
(a) 52 Sec. (b) 72 Sec.
(c) 56 Sec. (d) 64 Sec

5. A train 900 m long is running at a speed of 108 km/h. How much time will this train take to completely cross a 900 m long platform?
SSC CGL 14/07/2023 (Shift-01)
(a) 60 s (b) 45 s
(c) 30 s (d) 18 s

6. A 750 metres long train crosses a stationary pole in 15 sec. Travelling at the same speed, this train crosses a bridge completely in 25 sec. What is the length of this bridge?
SSC MTS 25/07/2022 (Shift- 3)
(a) 1000 m (b) 750 m
(c) 1250 m (d) 500 m

7. A train running at $40\frac{1}{2}$ km/h takes 24 second to cross a pole. How much time (in second) will it take to pass a 450 m long bridge?
SSC CGL 13/08/2021(Shift 03)
(a) 56 (b) 52
(c) 60 (d) 64

◆ TYPE – II ◆
TWO TRAINS CROSSING EACH OTHER IN OPPOSITE DIRECTION

8. Two trains 230 m and 270 m long are running in opposite directions at speeds of 42 km/h and 48 km/h, respectively. They cross each other in:
SSC CPO 28/06/2024 (Shift-01)
(a) 30 seconds (b) 22 seconds
(c) 20 seconds (d) 25 seconds

9. Two trains, one 125 metres and the other 375 metres long are running in opposite directions on parallel tracks, at the speed of 81 km/hr and 63 km/hr respectively. How much time will they take to cross each other?
SSC CHSL 09/03/2023 (Shift-04)
(a) 25 sec. (b) 15 sec.
(c) 12.5 sec. (d) 22.5 sec.

10. Two trains having lengths of 230 m and 240 m are 130 m apart. They start moving towards each other on parallel tracks, at speeds of 160 km/h and 200 km/h, respectively. In how much time will the trains cross each other?
SSC CHSL 08/06/2022 (Shift- 2)
(a) 5 Sec (b) 6 Sec
(c) 8 Sec (d) 7 Sec

11. A train 550 metres long is running at a speed of 78 km/h. How many seconds will it take to cross a 350 metres long train running in the opposite direction at a speed of 30 km/h?
SSC CHSL 05/07/2024 (Shift-03)
(a) 40 seconds (b) 20 seconds
(c) 50 seconds (d) 30 seconds

12. Two goods trains 132 m and 108 m in length are running towards each other on parallel tracks. The first train is running at a speed of 32 km/h and the second at a speed of 40 km/h. How much time will they take to cross each other after meeting?
SSC CGL 24/09/2024 (Shift-02)
(a) 12 sec (b) 10 sec
(c) 13 sec (d) 15 sec

13. Two trains A and B, 210 m and 150 m, respectively, in length, are running in the same direction on parallel lines. If the speed of A and B be 110 km/h and 128 km/h, respectively, then what will be the time (in seconds) taken by train B to cross train A?
SSC MTS 11/09/2023 (Shift- 03)
(a) 71 (b) 74
(c) 72 (d) 70

14. Two trains having the same speed are running in opposite directions. If the length of each train is 120 metres and they cross each other in 8 seconds, then, what is the speed of each train (in km/h)?
SSC MTS 12/09/2023 (Shift- 01)
(a) 60 (b) 45
(c) 50 (d) 54

15. Two trains each 200m long are moving in opposite directions. They cross each other in 10 seconds. If the speed of one train is 90km/h, find the speed of the other train.
SSC CHSL 25/05/2022 (Shift- 03)
(a) 90 km/h (b) 45 km/h
(c) 54 km/h (d) 36 km/h

16. A train traveling at 80 km/h crosses another train traveling in the same direction at 26 km/h in 30 seconds. What is the combine length of both the trains?
SSC CHSL 08/08/2023 Shift-04
(a) 400 m (b) 450 m
(c) 550 m (d) 350 m

17. Two trains, P and Q, are running on parallel tracks in opposite directions with lengths of 110 m and 140 m, respectively. Train P is running at a speed of 70 km/h and took 5 seconds to cross train Q. The speed of train Q is:
SSC CPO 29/06/2024 (Shift-03)
(a) 120 km/h (b) 110 km/h
(c) 90 km/h (d) 100 km/h

18. Two trains Mumbai Rajdhani and Kissan Express of lengths 850 m and 700 m are 1050 m apart, and are running on parallel tracks towards each other. Mumbai Rajdhani is running at 62 km/h and Kissan Express is running at 55 km/h. In how much time (in sec) will the trains cross each other?
SSC CPO 05/10/2023 (Shift-01)
(a) 80 (b) 70
(c) 75 (d) 45

19. A train of length 300 metres crosses a tree in 20 seconds and crosses another train of the same length travelling in opposite direction in 25 seconds. What is the speed of the second train ?
SSC CHSL 20/03/2023 (Shift-02)
(a) 10 m/s (b) 12 m/s
(c) 15 m/s (d) 9 m/s

20. A train of length 360 metres crosses an electric pole in 30 seconds and crosses another train of the same length travelling in opposite direction in 15 seconds. What is the speed of the second train?
SSC CHSL 16/03/2023 (Shift-02)
(a) 12 m/s (b) 36 m/s
(c) 24 m/s (d) 60 m/s

21. Two trains of lengths 310 m and 330 m, respectively, are 160 m apart. They start moving towards each other on parallel tracks, at speeds 130 km/h and 158 km/h, respectively. In how much time (in seconds) will the trains cross each other?
SSC CHSL 02/07/2024 (Shift-04)
(a) 10 (b) 8
(c) 12 (d) 18

22. A 320 m long train completely crosses a 240 m long train, coming from the opposite direction, in y seconds. If the first train is travelling at the speed of 44 km/h and the second train is travelling at 56.8 km/h, then what is the value of y?
SSC CPO 29/06/2024 (Shift-01)
(a) 21 (b) 18
(c) 20 (d) 22

23. A train of length 640 m crosses another train of length 920 m in 24 seconds. Two trains are running in opposite direction. If the speed of both the trains is same, what is the speed of the two trains?
SSC GD 01/03/2024 (Shift-02)
(a) 117 km/hr (b) 105 km/hr
(c) 136 km/hr (d) 129 km/hr

• TYPE – III •
TWO TRAINS CROSS EACH OTHER IN SAME DIRECTION

24. Two trains, 140 m and 120 m in length, are running in the same direction at the speed of 60 km/h and 78 km/h, respectively. In how much time will they completely cross each other?
SSC CPO 29/06/2024 (Shift-01)
(a) 52 second (b) 58 second
(c) 48 second (d) 65 second

25. Two trains of lengths 200 m and 250 m are running on parallel rail tracks at speeds of 68 km/h and 50 km/h, respectively. In how much time (in sec.) will they cross each other if they are running in the same direction?
SSC CPO 04/10/2023 (Shift-02)
(a) 90 (b) 80
(c) 75 (d) 85

26. Two trains A and B having the length 195 m and 165 m respectively, are running in the same direction on parallel lines. If the speed of A and B be 77 km/h and 85 km/h respectively, then what will be the time (in seconds) taken by them to cross each other?
SSC CPO 09/11/2022 (Shift-01)
(a) 162 (b) 164
(c) 160 (d) 166

27. Two trains of length 200 m and 325 m long are running on parallel rail tracks at speeds of 78 km/h and 60 km/h, respectively. In how much time (in seconds) the faster train cross the slower one if they are running in the same direction?
MTS 04/09/2023 (Shift- 01)
(a) 105 (b) 100
(c) 115 (d) 110

28. A train traveling at 70 km/h crosses another train traveling in the same direction at 34 km/h in 25 seconds. What is the combined length of both the trains (in metres)?
SSC CGL 18/07/2023 (Shift-03)
(a) 225 (b) 250
(c) 325 (d) 500

29. On parallel tracks , two trains of equal length are moving at speeds of 46 and 36 km/hr in the same direction. In 36 second , the quicker train overtake the slower one. The length of each train is:
SSC CHSL 07/08/2023 Shift-01
(a) 60 meter (b) 50 meter
(c) 56 meter (d) 52 meters

30. Two trains of equal length are running on parallel lines in the same direction at 36 km/h and 54 km/h. The faster train passes the slower train in 48 seconds. The length of each train (in m) is:
MTS 06/09/2023 (Shift- 01)
(a) 80 (b) 160
(c) 240 (d) 120

31. Two trains P and Q of lengths 320 meter and 540 meter, respectively, are running in the same direction on parallel tracks at 108 km/h and 144 km/h, respectively. How much time will the trains take to cross each other completely?
SSC CGL 18/07/2023 (Shift-01)
(a) 86 s (b) 54 s
(c) 32 s (d) 68 s

32. Two trains of length 110 m and 85 m are moving in the same direction at 12 m/s and 7 m/s, respectively. Find the time (in sec) taken by the faster train to cross the slower train.
MTS 01/09/2023 (Shift- 01)
(a) 39 (b) 35
(c) 19 (d) 29

33. Two trains are travelling in the same direction on parallel tracks. Train A is travelling at 30 km/h and Train B is travelling at 60 km/h. If Train A is 400 m long and it takes Train B two minutes to pass Train A, what is the length of Train B?
SSC MTS 13/09/2023 (Shift- 01)
(a) 500 m
(b) 400 m
(c) 600 m
(d) 700 m

34. Two trains are running on parallel tracks in the same direction at the speed of 80 km/h and 90 km/h, respectively. The trains crossed each other in 3 minutes. If the length of one train is 230 m, then what is the length (in m) of the other train?
SSC CGL 21/04/2022 (Shift-02)
(a) 270 (b) 300
(c) 250 (d) 230

35. The lengths of two trains are 380 m and 220 m. The faster of these two trains takes 20 seconds to overtake the other, when travelling in same direction. The trains take 12 seconds to cross each other, when travelling in opposite directions. What is the speed (in km/h) of the faster train?
SSC Phase IX 2022
(a) 108 (b) 126
(c) 144 (d) 90

36. Two trains of lengths 150 m and 250 m run on parallel lines. When they run in the same direction, they take 20 seconds to cross each other and, when they run in the opposite direction, they take 5 seconds to cross each other. What is the speed of the two trains?
SSC CGL 19/09/2024 (Shift-01)
(a) 150 km/h and 105 km/h
(b) 150 km/h and 250 km/h
(c) 180 km/h and 108 km/h
(d) 160 km/h and 106 km/h

37. Train A running at 81 km/h takes 72 sec to overtake train B, when both the trains are running in the same direction, but it takes 36 sec to cross each other if the trains are running in the opposite direction. If the length of train B is 600 metres, then find the length of train A. (in metres)
SSC CGL 13/12/2022 (Shift-03)
(a) 600 (b) 480
(c) 590 (d) 900

• TYPE – IV •
WHEN A TRAIN CROSSES 1 OR 2 RUNNING PERSONS

38. A 1800 metres, long train crosses a man walking in opposite direction in 10 seconds. If the speed of train is 8 times to the speed of man, then what is the speed of train?
SSC CHSL 21/03/2023 (Shift-03)
(a) 576 km/hr (b) 640 km/hr
(c) 596 km/hr (d) 570 km/hr

39. A 228 m long train is running at 125 km/h. In what time (in seconds), will it pass a man running at 17 km/h in the same direction in which the train is going?
SSC MTS 14/09/2023 (Shift- 03)
(a) 9.2 (b) 8.5
(c) 6.2 (d) 7.6

40. If a train 130 m long takes $6\frac{1}{2}$ seconds to cross a man who is walking at 12 km/h in the same direction in which the train going, then the speed of the train (in km/h) is:
SSC CHSL 04/08/2023 (Shift-02)
(a) 84 (b) 64
(c) 48 (d) 74

41. A 240 m long train overtakes a man walking at 6 km/h, in the same direction, in 9 seconds. How much time (in seconds) will it take to pass a 372 m long tunnel with the same speed?
SSC CGL 13/08/2021(Shift 02)
(a) 21.6 (b) 20
(c) 18 (d) 20.4

42. A train running at 48 km/h crosses a man going with the speed of 12 km/h, in the same direction, in 18 seconds and passes a woman coming from the opposite direction in 12 seconds. The speed (in km/h) of the woman is:

SSC CGL 23/08/2021(Shift 03)

(a) 8 (b) 9
(c) 6 (d) 10

43. A train crosses two persons travelling at 4 km/h and 6 km/h in the same direction in 12sec and 14 sec, respectively. The speed of the train is ________.

SSC CPO 11/09/2022 (Shift - 02)

(a) 18 km/h (b) 26 km/h
(c) 20 km/h (d) 24 km/h

44. A 234 m long train passes a person running at 9 km/h in the opposite direction, in 6 seconds. In how much time (in seconds) will it pass another person who is moving at 23.4 km/h, in the same direction?

SSC CPO 29/06/2024 (Shift-02)

(a) 8 (b) 8.4
(c) 7.2 (d) 7.8

◆ TYPE – V ◆
WHEN A TRAIN CROSSES A PERSON SITTING INSIDE ANOTHER TRAIN

45. Two trains are moving in the same direction at 60 km/h and 42 km/h. The faster train crosses a man in the slower train in 36 seconds. Find the length of the faster train.

SSC CPO 28/06/2024 (Shift-03)

(a) 185 m (b) 180 m
(c) 195 m (d) 175 m

46. Renu was sitting inside train A, which was travelling at 50 km/h. Another train, B whose length was three times the length of A crossed her in the opposite direction in 15 seconds. If the speed of train B was 58 km/h, then the length of train A (in m) is :

SSC CGL TIER II (12/09/2019)

(a) 210 (b) 180
(c) 160 (d) 150

47. Two trains are moving in the same direction at the speed of 36 km/hr and 48 km/hr. The time taken by faster train to cross a man sitting in the slower train is 33 seconds. What will be the length of the faster train?

SSC CGL 07/12/2022 (Shift-04)

(a) 770 metres (b) 90 metres
(c) 110 metres (d) 180 metres

48. Trains P and Q are running in the same direction on parallel tracks with speeds of x km/h and 90 km/h ($90 > x$), respectively. The faster train passes a man sitting in the slower train in 30 seconds. If the length of train Q is 225 m, then what is the value of x?

SSC Phase IX 2022

(a) 65 (b) 60
(c) 68 (d) 63

◆ TYPE – VI ◆
MISCELLANEOUS QUESTIONS

49. A train travelling at the speed of x km/h crossed a 300 m long platform in 30 seconds, and overtook a man walking in the same direction at 6 km/h in 20 seconds. What is the value of x?

SSC CPO 24/11/2020 (Shift-2)

(a) 60 (b) 96
(c) 48 (d) 102

50. Train 'A' requires 15 seconds to cross train 'B' of length 300 m moving in the opposite direction at a speed of 36 km/h. Further, train 'A' requires 30 seconds to cross a 500 m long stationary train 'C'. Find the length (in m) of train 'A'.

SSC CPO 03/10/2023 (Shift-02)

(a) 275 (b) 200
(c) 250 (d) 300

51. A 252 m long train is running at a speed of 125 km/h. What is the time (in seconds) in which it will pass a man who starts from the engine running at the speed of 17 km/h in the same direction as that of the train?

SSC CGL 27/07/2023 (Shift-03)

(a) 7.6 (b) 8
(c) 8.4 (d) 6.4

ANSWER KEY

1.	(b)	2.	(c)	3.	(d)	4.	(a)	5.	(a)	6.	(d)	7.	(d)	8.	(c)	9.	(c)	10.	(b)
11.	(d)	12.	(a)	13.	(c)	14.	(d)	15.	(c)	16.	(b)	17.	(b)	18.	(a)	19.	(d)	20.	(b)
21.	(a)	22.	(c)	23.	(a)	24.	(a)	25.	(a)	26.	(a)	27.	(a)	28.	(b)	29.	(b)	30.	(d)
31.	(a)	32.	(a)	33.	(c)	34.	(a)	35.	(c)	36.	(c)	37.	(b)	38.	(a)	39.	(d)	40.	(a)
41.	(a)	42.	(c)	43.	(a)	44.	(d)	45.	(b)	46.	(d)	47.	(c)	48.	(d)	49.	(b)	50.	(b)
51	(c)																		

SOLUTIONS

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} \propto \text{distance}$$

$$\text{Speed} \propto \frac{1}{\text{Time}}$$

Change m/s to km/h multiply by $\frac{18}{5}$

Change km/h to m/s multiply by $\frac{5}{18}$

1. (b) Length of train = 180 m

Speed of train = 54 km/hr.

$$= 54 \times \frac{5}{18} = 15 \text{ m/sec.}$$

$\therefore$ Time taken to cross a man

$$= \frac{\text{Length of train}}{\text{Speed of train}} = \frac{180}{15} = 12\text{sec.}$$

2. (c) Distance = Speed × Time

Length of bridge

$$= 9 \times \frac{5}{18} \times 45 \times 60 = 150 \times 45 = 6750$$

Note:- Use unit digit method to get answer quickly.

3. (d) $\text{Speed} = \frac{\text{Length of train + Length of tunnel}}{\text{Time}}$

$$= \frac{350+1250}{80} = \frac{1600}{80} = 20 \text{ m/s.}$$

$$= 20 \times \frac{18}{5} = 72 \text{ km/hr}$$

4. (a) $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$$\text{Speed} = 72 \times \frac{5}{18} = 20 \text{ m/s}$$

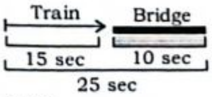
$$\therefore \ T = \frac{330+710}{20} = 52 \text{ second}$$

Note: If the train crosses the Platform which means it cross the length of own as well as the length of Platform.

5. (a) Time taken by train to clear Platform

$$= \frac{900+900}{108 \times \frac{5}{18}} = \frac{1800}{30} = 60 \text{ sec.}$$

6. (d) Length of train = 750



$$15 \text{ sec} \rightarrow 750 \text{ m}$$

$$10 \text{ sec} \rightarrow \frac{750}{15} \times 10 = 500 \text{ m}$$

Alternate Method:

L_T = length of train = 750m

∴ Speed = $\frac{750}{15}$ = 50 m/sec.

∴ $L_T + L_B = 50 \times 25 = 1250$

⇒ $L_B = 1250 - 750 = 500$m.

7. (d) Speed of train = $\frac{81}{2}$ km/h

$= \frac{81}{2} \times \frac{5}{18} = \frac{45}{4}$ m/s

Now,

Time taken by train to pass the bridge = $24 + \frac{450 \times 4}{45}$

= 64 second

8. (c) Total distance = 230 + 270

= 500 metre

Relative speed when moving in opposite direction

= 48 + 42 = 90 km/h.

$= 90 \times \frac{5}{18} = 25$ m/s

Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{500}{25}$

= 20 sec

9. (c) T_1 = 125m, T_2 = 375m

SP_1 = 81 km/h, SP_2 = 63 km/h

Since both trains are running in opposite direction

So, Relative Speed = 81 + 63

= 144 km/h

$= 144 \times \frac{5}{18}$ m/sec = 40 m/sec

∴ Time = $\frac{125+375}{40} = \frac{500}{40}$

= 12.5 sec

10. (b) $T_A \xrightarrow[160\text{ km/h}]{230\text{ m}} \overset{130\text{ m}}{\sim\!\sim\!\sim} \xleftarrow[200\text{km/h}]{240\text{ m}} T_B$

Time = $\frac{\text{Distance}}{\text{Relative Speed}}$

$= \frac{600}{360 \times \frac{5}{18}} = 6$ sec

11. (d) Since, A and B travel in opposite direction

Relative speed = (78 + 30) km/hr.

$= 108 \times \frac{5}{18}$ m/s

= 30m/s

∴ Time = $\frac{\text{Distance}}{\text{Relative Speed}}$

$= \frac{550+350}{30} = \frac{900}{30} = 30$ sec.

12. (a) Relative speed = 32 + 40 = 72 km

Distance = Speed × Time

⇒ $(132 + 108) = 72 \times \frac{5}{18} \times$ time

⇒ 240 = 20 × time

⇒ time = 12 sec

∴ Time required to cross each other = 12 sec

13. (c) Relative speed in same direction = 128 − 110 = 18 km/h = 5 m/sec

∴ Time = $\frac{\text{Distance}}{\text{Speed}}$

∴ Time taken by B to cross A

$= \frac{210+150}{5} = 72$ seconds

14. (d) Let the speed of each train is x km/h

∵ speed = $\frac{\text{Distance}}{\text{Time}}$

Relative speed in opposite direction

$= x + x = 2x$ km/h

ATQ,

⇒ $2x = \frac{(120+120)}{8} \times \frac{18}{5}$

⇒ $2x = \frac{240 \times 18}{40}$

⇒ $x = 54$ km/h

15. (c) Let the speed of 2nd train = S_B

ATQ,

⇒ $(90 + S_B) = \frac{400}{10} \times \frac{18}{5}$ km/hr.

⇒ $90 + S_B = 144$

⇒ $S_B = 144 - 90 = 54$ km/hr.

16. (b) Let the length of 1st train = L_A

Let the length of 2nd train = L_B

ATQ,

$L_A + L_B = (80 - 26) \times \frac{5}{18} \times 30$

= 3 × 5 × 30 = 450m

17. (b) Net speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{110+140}{5} = \frac{250}{5}$

$= 50$ m/s $= 50 \times \frac{18}{5} = 180$ km/h

Speed of train P = 70 km/h

Speed of train Q = 180 − 70

= 110 km/h

18. (a) L_m = 850m, L_k = 700 m

S_m = 62 km/hr, S_k = 55 km/hr

Required time = $\frac{\text{Distance}}{\text{Relative Speed}}$

$= \frac{(850+700+1050)}{(62+55) \times \frac{5}{18}} = \frac{2600 \times 18}{117 \times 5}$

= 80 sec.

19. (d) Length = 300 m

Time = 20 sec

Speed = $\frac{D}{T} = \frac{300}{20} = 15$m/s

Crosses another train of same length travelling in opposite direction in 25 second

Speed of the second train = x m/s

ATQ,

⇒ $25 = \frac{300+300}{15+x}$

⇒ $25 = \frac{600}{15+x}$

⇒ $15 + x = 24$ ⇒ $x = 9$m/s

20. (b) Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{360}{30}$

= 12m/s

Crosses another train of same length travelling in opposite direction in 15 sec

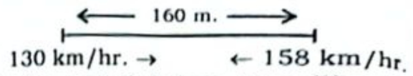
Speed of the second train = x m/s

⇒ $\frac{360+360}{12+x} = 15$

⇒ $720 = 180 + 15x$

⇒ $540 = 15x$ ⇒ $x = 36$m/s

21. (a)



Relative speed (when travelling in opposite direction)

= 130 + 158 = 288 km/hr

$= 288 \times \frac{5}{18}$ m/s = 80 m/s

Total distance

= 310m + 330m + 160m = 800 m

∴ Time = $\frac{\text{Distance}}{\text{Relative Speed}} = \frac{800}{80}$

= 10 second.

22. (c) Total distance = 320 + 240=560 m

Relative speed (opposite direction)

= 44 + 56.8 = 100.8 km/h

Time = y second

Now,

Distance = Speed × Time

⇒ $560 = 100.8 \times \frac{5}{18} \times y$

⇒ y = 20 second

23. (a) Distance = (640 + 920)=1560 m

time = 24 sec. & speed = $(S_1 + S_2)$

We know, $S_1 + S_2 = \frac{L_1 + L_2}{T}$

$S_1 + S_2 = \frac{1560}{24} \times \frac{18}{5}$ km/h

$S_1 + S_1 = 65 \times \frac{18}{5}$ km/h $[S_1 = S_2]$

$2S_1 = \frac{13 \times 18}{2}$ km/h

S_1 = 117 km/h

Therefore, the speed of both the trains is 117 km/h.

Alternate Method:

640 + 920 = 1560

$\frac{1560}{24} \times \frac{18}{5} = 117$ km/h

24. (a) Total distance =140 + 120

= 260 m

Relative speed when trains running in same direction = 78 − 60

= 18 km/h = 5 m/s

Time = $\frac{\text{distance}}{\text{speed}} = \frac{260}{5} = 52$ second

25. (a) L_A = 200, L_B = 250

S_A = 68, S_B = 50

ATQ,

Relative speed when travelling in same direction = (68 − 50) km/h

$= 18$ km/h $= 18 \times \frac{5}{18}$ m/s = 5 m/s

∴ Required time = $\frac{(200+250)}{5}$

$= \frac{450}{5} = 90$ sec.

26. (a) Relative speed in same direction

= (85 − 77) km/h.

= 8km/h.

Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{195+165}{8}$

$= \frac{360}{8} \times \frac{18}{5} = 162$ seconds

Time taken by them to cross each other = 162 seconds.

27. (a) Relative speed in same direction $= 78 - 60 = 18$ km/h.

$= 18 \times \frac{5}{18} = 5$ m/sec.

$\because$ Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{200 + 325}{5} = \frac{525}{5} = 105$ sec.

$\therefore$ The faster train cross the slow train in 105 seconds.

28. (b) Let, Combined length of both trains $= x$

In same direction,

Relative speed $= 70 - 34 = 36$ km/h

$= 36 \times \frac{5}{18} = 10$ m/s

ATQ,

Cross the another train in 25 sec.

Thus, $\frac{x}{10} = 25 \Rightarrow x = 250$m

29. (b) Let the length of both train be l

ATQ,

$(l + l) = (46 - 36) \times \frac{5}{18} \times 36 = 10 \times 10$

$\Rightarrow l + l = 100$m

$\Rightarrow l = 50$ meter

30. (d) Relative speed $= 54 - 36$

$= 18$ km/h $= 5$ m/sec

In 5 m/sec, total distance $= 48 \times 5$

$= 240$ m

The length of each train $= \frac{240}{2} = 120$ m.

31. (a) Length of train P = 320 m

Length of train Q = 540 m

Relative speed of running in the same direction on parallel tracks at 108 km/h and 144 km/h

$= 144 - 108 = 36$ km/h

Train will cross each other completely in

$= \frac{320 + 540}{36 \times \frac{5}{18}} = \frac{860}{10} = 86$ sec

32. (a) Relative speed of both train in same direction $= 12 - 7 = 5$ m/sec.

Speed $= \frac{\text{Dis tan ce}}{\text{Time}}$

Time $= \frac{110 + 85}{5} = 39$ sec.

Faster train cross the slower train in 39 sec.

33. (c) Let the length of train B is x m.

Relative speed in same direction

$= 60 - 30 = 30$ km/h

$= 30 \times \frac{5}{18}$ m/sec

Distance = Speed × Time

$\Rightarrow 400 + x = 30 \times \frac{5}{18} \times 2 \times 60$

$\Rightarrow 400 + x = 1000$

$\therefore x = 600$ m

34. (a) Let the length of second $T_2 = x$ m

$T_1 \xrightarrow[230]{80 \text{ km/h}}$

$\longrightarrow 3$ minute

$T_2 \xrightarrow[x]{90 \text{ km/h}}$

Distance = Relative speed × Time

$\Rightarrow (230 + x) = (90-80) \times \frac{5}{18} \times 3 \times 60$

$\Rightarrow 230 + x = 10 \times \frac{5}{18} \times 180$

$\Rightarrow x = 500 - 230 = 270$ m

35. (c) $T_1 \xrightarrow{380 \text{ m}} x$ km/h

$\longrightarrow 20$ sec

$T_2 \xrightarrow{220 \text{ m}} y$ km/h

$T_1 \xrightarrow{380 \text{ m}} x$ km/h

12 sec $\longleftarrow$

y km/h $\xleftarrow{220 \text{ m}} T_2$

Time $= \frac{\text{Distance}}{\text{Relative Speed}}$

$\Rightarrow 20 = \frac{600}{x - y} \Rightarrow x - y = 30$ m/s ..... (i)

Again,

$\Rightarrow 12 = \frac{600}{x + y} \Rightarrow x + y = 50$ m/s .... (ii)

From eq^n (i) & (ii)

$x = \frac{80}{2} = 40$ m/s $\times \frac{18}{5} = 144$ km/h

36. (c) Let speed of I train $= S_A$

and speed of II train $= S_B$

ATQ,

$S_A + S_B = \frac{150 + 250}{5} = 80$ m/s

and, $S_A - S_B = \frac{150 + 250}{20} = 20$ m/s

$\therefore S_A = \frac{80 + 20}{2} = 50$ m/s

$= 50 \times \frac{18}{5} = 180$ km/h

and, $S_B = 30$ m/s $= 108$ km/hr

37. (b) Since both trains running in the same direction

$(A - B) \times 72 = L_A + 600$

$\Rightarrow \frac{5}{18}(81 - B) \times 72 = L_A + 600$ .....(i)

Also,

$\Rightarrow \frac{5}{18}(A + B) \times 36 = L_A + 600$ ....(ii)

From (i) and (ii)

$\Rightarrow \frac{5}{18} \times (81 - B)72 = (81 + B)\, 36 \times \frac{5}{18}$

$\Rightarrow 81 \times 2 - 2B = 81 + B$

$\Rightarrow 3B = 81 \Rightarrow B = \frac{81}{3} = 27$

Now, Put the value of B in (i)

$\Rightarrow (81 - 27) \times 72 \times \frac{5}{18} = L_A + 600$

$\Rightarrow 1080 - 600 = L_A$

$\Rightarrow L_A = 480$ mtr.

Alternate Method:

Speed of A $= 81$ km/h $\times \frac{5}{18}$

$= 22.5$ m/sec

Speed of B $= x$ m/sec

Total length = D m,

Time = 72 : 36

Speed = 1 : 2

ATQ,

$\frac{22.5 - x}{22.5 + x} = \frac{1}{2}$

$\Rightarrow 45 - 2x = 22.5 + x$

$x = 7.5$ m/sec

$\because \frac{D}{22.5 - x} = 72,$

$\Rightarrow D = 72 \times 15 = 1080$ m.

Length of train A $= 1080 - 600$

$= 480$ m.

38. (a) Speed of train and man = 8 : 1

Speed $= \frac{\text{Distance}}{\text{Time}}$

Man is walking opposite to the train

Average speed $= 8x + x = 9x$

$\Rightarrow 9x = \frac{1800}{10}$

$\Rightarrow x = 20$ m/sec

Speed of train $= 8x = 8 \times 20$

$= 160$ m/sec $= 160 \times \frac{18}{5}$ km/h

$= 576$ km/h

39. (d) Relative speed in same direction

$= 125 - 17 = 108$ km/h

$= 108 \times \frac{5}{18} = 30$ m/sec

$\therefore$ Crossing time $= \frac{228}{30} = 7.6$ seconds.

40. (a) Distance = Speed × Time

ATQ,

$130 = (x - 12) \times \frac{5}{18} \times \frac{13}{2}$

$\Rightarrow (x - 12) = 72$

$\therefore x = 84$ km/h

41. (a) Length of train = 240 m

Time $= \frac{\text{Distance}}{\text{Speed}}$

$\Rightarrow 9 = \frac{240}{(x - 6) \times \frac{5}{18}} \Rightarrow 9 \times \frac{5}{18}(x - 6)$

$= 240$

$\Rightarrow x - 6 = 96 \Rightarrow x = 102$ km/h

Now,

Time $= \frac{240 + 372}{102 \times \frac{5}{18}} = \frac{612 \times 18}{102 \times 5} = 21.6$ sec.

42. (c) Let speed of women $= x$

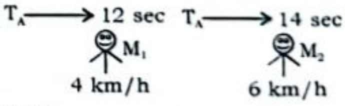
$D = (48 - 12) \times \frac{18}{3600} = (48 + x) \times \frac{12}{3600}$

$= 36 \times 18 = (48 + x) \times 12$

$= 648 = 576 + 12x$

$x = 6$ km/h

43. (a) Let the speed of train $= x$ km/h



ATQ,

$\Rightarrow (x - 4) \times 12 = (x - 6) \times 14$

$\Rightarrow 6x - 24 = 7x - 42$

$x = 18$ km/h

So, The speed of the train is 18 km/h

44. (d) Speed of train $= x$ km/h

Length of train = 234m

Speed of men = 9 km/h

Relative speed $= (x + 9)$ km/h

$= (x + 9) \times \frac{5}{18}$ m/s

ATQ,

Time $= \frac{\text{Length of train}}{\text{Relative speed}}$

$\Rightarrow 6 = \frac{234 \times 18}{(x + 9) \times 5}$

$\Rightarrow 234 \times 18 = 30x + 270$

$\Rightarrow 4212 - 270 = 30x$

$\Rightarrow 3942 = 30x$

$\Rightarrow x = 131.4$

Time for second person

$= \frac{234\times18}{(131.4-23.4)\times5}$

$= \frac{234\times18}{108\times5}$

= 7.8 sec.

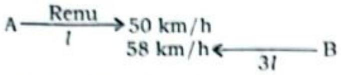
45. (b) Relative speed when moving in same direction = 60 – 42

= 18 km/h = 5m/s

Distance = Length of faster train

= 36 × 5 = 180 m

46. (d)



Distance = Speed × Time

$\Rightarrow 3L = 108\times\frac{5}{18}\times15$

$\Rightarrow L = 150$ m

47. (c) ***Note:*** If 2 trains pass each other in the same direction then their relative speed will be equal to the difference in speeds of the 2 trains.

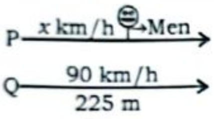
Relative speed = 48 –36=12 km/hr

$\Rightarrow \frac{\text{Length of faster train}}{\text{Relative speed}} = \text{Time}$

$\Rightarrow \text{Length} = 33\times12\times\frac{5}{18}$

$= 55\times2 = 110$ metre.

48. (d)



$\Rightarrow \text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$\Rightarrow 30 = \frac{225}{(90-x)\times\frac{5}{18}}$

$\Rightarrow 30 = \frac{225\times18}{(90-x)\times5}$

$\Rightarrow x = 90-27$

= 63 km/h

Alternate Method:

Distance ∝ Speed

L_P : L_Q

Time taken by passenger : Time taken to cross both train each other – Time taken by P

$30 : 30-\frac{225\times18}{90\times5}$

30 : 30 – 9

30 : 21

$\downarrow\times3$: $\downarrow\times3$

90 km/h : $\boxed{63\text{ km/h}}$

SMART APPROACH:-

Relative speed of

$P \,\&\, Q = \frac{225}{30} = \frac{15}{2}$ m/s

$= \frac{15}{2}\times\frac{18}{5} = 27$ km/h

Relative speed = P – Q = 27

Q = 90 – 27 = 63 km/h

49. (b) $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

Let the length of train = T_A

Case-I: $\xrightarrow{\text{Train}}$

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$\Rightarrow 30 = \frac{L_A+300}{x\times\frac{5}{18}}$ ...... (i)

Case-II: $\xrightarrow{\text{Men}}$

Relative speed = $(x-6)$ km/h

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$\Rightarrow 20 = \frac{L_A}{(x-6)\times\frac{5}{18}}$ ..... (ii)

From eqⁿ __ (i) & (ii)

$20(x-6)\times\frac{5}{18} = 30\times x\times\frac{5}{18} - 300$

$\Rightarrow \frac{x-6}{9} = \frac{x}{6} - 6$

$\Rightarrow 2x-12 = 3x-108$

$\Rightarrow x = 96$

Alternate Method:

Distance = Speed × Time

$L_A + 300 = x\times\frac{5}{18}\times30$

$L_A = \frac{25x}{3} - 300$ ...... (i)

Again,

$L_A = (x-6)\times\frac{5}{18}\times20$

Now,

$\frac{25x}{3} - 300 = \frac{50}{9}(x-6)$

$\Rightarrow \frac{25x}{3} - \frac{50x}{9} = 300 - \frac{300}{9}$

$\Rightarrow \frac{25x}{9} = \frac{2400}{9}$

$\Rightarrow x = 96$

50. (b) Let, length of train A = L_A

Time taken by train A = 30 sec.

Length of train C = 500 m

So speed of train A

$= (S_A) = \frac{L_A+500}{30}$

Speed of train B = 36 km/hr

$= 36\times\frac{5}{18} = 10$ m/sec

Time = 15 second

Length of B = 300 meter

ATQ,

$(S_A + 10) = \frac{L_A+300}{15}$

$\Rightarrow (L_A+300) = \left(\frac{L_A+500}{30}+10\right)\times15$

$\Rightarrow L_A + 300 = \frac{L_A+500+300}{30}\times15$

$\Rightarrow 2L_A + 600 = L_A + 800$

$\therefore L_A = 200$ m

51. (c) Speed of train = 125 km/h

Speed of man = 17 km/h

Relative speed = 125 – 17

= 108 km/h

$= 108\times\frac{5}{18} = 30$m/sec

$\therefore \text{Time} = \frac{252}{30}$ sec = 8.4 sec

SELECTION मंत्र #06

"How to avoid sleep while Studying ?"

#Hacks:-

☞ **Stay hydrated –** Drink water regularly, as dehydration can make you feel sluggish.

☞ **Posture:** Sit upright in a comfortable chair to avoid slouching. A proper posture keeps you alert and focussed.

☞ **Move around:** Stand up, stretch, or walk around briefly during breaks to keep your blood circulationflowing.

☞ **Avoid comfort zone :** Stay away from your bed or other relaxing spaces. Study in an area that signals your brain it's time to focus.

17 Chapter

BOAT & STREAM

• TYPE – I •

BASIC QUESTIONS

1. If the speed of swimmer is 9 km/hr in still water and the speed of stream is 5 km/hr then find the speed of swimmer against the stream and along the stream.

(a) 3, 12 (b) 2, 10
(c) 4, 14 (d) 1, 8

2. If the speed of a boat in still water is 3 km/h and if its upstream speed is 1 km/h, find the speed of the stream.

SSC CHSL 11/07/2024 (Shift-03)

(a) 0.5 km/h (b) 1 km/h
(c) 0.25 km/h (d) 2 km/h

3. A boatman rows 2 km in 10 min., along the stream and 12 km in 2 hrs against the stream. What is the speed of the stream?

SSC CPO 28/06/2024 (Shift-01)

(a) 3 km/h (b) 2.5 km/h
(c) 4 km/h (d) 3.5 km/h

4. A boat covers a distance of 55 km downstream in 5 hours while it takes 11 hours to cover the same distance upstream. What is the speed of the boat?

SSC CGL 23/09/2024 (Shift-03)

(a) 8 km/h (b) 9 km/h
(c) 11 km/h (d) 7 km/h

5. The speed of a boat when travelling downstream is 33 km/h, whereas when travelling upstream it is 27 km/h. What is the speed of the boat in still water?

SSC CPO 29/06/2024 (Shift-02)

(a) 6 km/h (b) 60 km/h
(c) 12 km/h (d) 30 km/h

6. The speed of a boat when travelling downstream is 48 km/h, whereas when travelling upstream it is 32 km/h. What is the speed of the boat in still water?

SSC Phase XI 28/06/2023 (Shift-02)

(a) 80 km/h (b) 30 km/h
(c) 40 km/h (d) 20 km/h

7. Two boats move downstream in a river at the speed of 35 km/hr and 25 km/hr. The speed of the stream is 4 km/hr. Initially the distance between the two boats is 60 km. If both the boats are moving downstream, in what time will they meet each other?

SSC MTS 15/05/2023 (Shift-03)

(a) 10 hours (b) 13 hours
(c) 6 hours (d) 8 hours

8. The ratio of the speeds of a boat while going upstream and going downstream is 2 : 3 and the sum of these two speeds is 15 km/h. What is the speed of the stream ?

SSC CHSL 08/07/2024 (Shift-02)

(a) 3.5 km/h (b) 1.5 km/h
(c) 3 km/h (d) 2.5 km/h

9. A boat running upstream takes 10 hours to cover a certain distance, while it takes 7 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and that of the water current respectively?

SSC CGL 25/07/2023 (Shift-03)

(a) 17 : 5 (b) 3 : 17
(c) 2 : 17 (d) 17 : 3

10. The speed of a boat in still water is $5\frac{1}{3}$ km/h. It is found that the boat takes thrice as much time to row up than it does to row down the same distance in the river stream. Find the speed of the river stream.

SSC CGL 05/12/2022 (Shift- 02)

(a) $\frac{23}{27}$ m/sec (b) $\frac{22}{27}$ m/sec
(c) $\frac{20}{27}$ m/sec (d) $\frac{19}{27}$ m/sec

11. A man can row 18 km/h in still water. It takes him two times as long to row up as to row down the river. Find the rate of the stream.

SSC CHSL 01/07/2024 (Shift-03)

(a) 12 km/h (b) 6 km/h
(c) 24 km/h (d) 9 km/h

12. A man can row a boat at speed of 8 km/h in still water. It takes thrice as long to row upstream as it does to row downstream. Find the speed of the stream (in km/h).

SSC CHSL 08/07/2024 (Shift-04)

(a) 4 (b) 6
(c) 5 (d) 3

13. The time taken by a boat to cover a distance of x km upstream is double the time taken by the boat to cover the same distance downstream. The sum of the speeds of the boat and the stream is 90 km/h. The speed of the stream is __ km/h.

SSC MTS 12/09/2023 (Shift-03)

(a) 22.5 (b) 33.5
(c) 27.5 (d) 37.5

14. A man rows to a place 48 km distant and comes back in 14 hours. He finds that he can row 4 km with the stream in the same time as 3 km against the stream. The speed of the stream is:

SSC CGL 07/12/2022 (Shift-02)

(a) 1.5 km/h (b) 3.5 km/h
(c) 1.8 km/h (d) 1 km/h

15. The speed of a boat downstream is 2.5 times the speed of the boat upstream. If the time taken by the boat for going 30 km downstream and the same distance upstream is 7 hours, then what is the speed (in km/h) of the boat downstream?

SSC MTS 27/10/2021 (Shift-02)

(a) 9 (b) 12.5
(c) 15 (d) 7.5

16. The speed of a boat downstream is 150% more than its speed upstream. If the time taken by the boat for going 80km downstream and 50km upstream is 8.2 hours, then what is the speed (in km/h) of the boat downstream?

SSC CHSL 12/08/2021 (Shift-01)

(a) 16 (b) 30
(c) 25 (d) 24

17. The speed of the boat in downstream is 125% of the speed of the boat in still water. If the boat takes 30 minutes to cover a distance of 20 km in still water, then how much time (in hours) will it take to cover a distance of 15 km upstream?

SSC CGL 19/07/2023 (Shift-03)

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$
(c) $\frac{1}{4}$ (d) 1

18. The ratio of the speed of the boat in still water to the speed of the stream is 8 : 3 and the boat can travel 22 km downstream in 24 minutes. Then, how much time will the boat take to cover 50 km upstream?

SSC CHSL 13/03/2023 (Shift-02)

(a) 4 hours (b) 2.5 hours
(c) 3 hours (d) 2 hours

19. A boat travels 5 km upstream in 15 minutes. If the ratio of the speed of the boat in still water to the speed of the stream is 6 : 1, then how much time will the boat take to cover a distance of 19.6 km in downs tream? (in minutes)

SSC MTS 13/07/2022 (Shift-01)

(a) 54 (b) 26
(c) 42 (d) 31

20. The speed of a boat in still water is 25 km/h. It takes $33\frac{1}{3}\%$ more time to cover a certain distance in still water than to cover the same distance downstream. How much time in hours will boat take to go 75 km downstream?

SSC Phase IX 2022

(a) 3 (b) 2.25
(c) 2 (d) 18

21. A boatman rows to a place 30 km distance and back in 14 hours. He finds that he can row 10 km with the stream at the same time as 4 km against the stream. Find the speed (in km/h) of the stream.

SSC CGL 13/09/2024 (Shift-03)

(a) $\frac{9}{2}$ (b) $\frac{9}{4}$
(c) $\frac{2}{9}$ (d) $\frac{4}{9}$

22. A man rows 48 km and back in 48 hrs. He can row 4 km with the stream in the same time as 3 km against the stream. The speed of the stream (in km/h) is:

SSC CPO 29/06/2024 (Shift-02)

(a) $\frac{5}{21}$ (b) $\frac{7}{21}$
(c) $\frac{7}{24}$ (d) $\frac{3}{29}$

23. Ashu can row 7.5 km an hour in still water. He finds that it takes four times as much time to row upstream, as it takes to row downstream. The speed of the stream is:

SSC CPO 27/06/2024 (Shift-02)

(a) 3.5 km/h (b) 1.5 km/h
(c) 4.5 km/h (d) 2.5 km/h

24. A man wishes to cover 1 km distance in river water. In still water he takes 12 minutes to cover it, but in the flowing river he takes 13 minutes. The speed of the flowing water of the river is:

SSC CPO 27/06/2024 (Shift-01)

(a) 25 km/h (b) $\frac{5}{13}$ km/h
(c) 22 km/h (d) $\frac{7}{12}$ km/h

25. A boat can travel 60km downstream in 4 hours. If the speed of the boat in still water is 13 km/h, then in what time will it cover 30 km upstream?

SSC CHSL 02/07/2024 (Shift-01)

(a) $2\frac{8}{11}$ hours (b) $3\frac{4}{7}$ hours
(c) $2\frac{4}{7}$ hours (d) $3\frac{5}{7}$ hours

26. A boat can travel with a speed of 19 km/h in still water. If the speed of the stream is 3 km/h, then what will be the total time (in hours) taken by the boat to go 88 km downstream and 24 km upstream ?

SSC CHSL 04/08/2021 (Shift- 01)

(a) 4.5 (b) 5
(c) 4 (d) 5.5

27. A person can row 5m/sec in still water. The speed of the stream is 6 km/h. The time (in hours) taken by him to row a distance of 76.8 km downstream is:

SSC MTS 05/10/2021 (Shift- 02)

(a) 3.5 (b) 2.8
(c) 3.2 (d) 2.4

28. Sunil can row a boat 20 km upstream in 1 hour 15 minutes. If the speed of the current of the river is 2 km/h, then how much time will he take to row the boat 30 km downstream ?

SSC CHSL 10/08/2021 (Shift- 01)

(a) 1 hr 10 min (b) 1 hr 45 min
(c) 1 hr 30 min (d) 1 hr 20 min

29. A boat can go 54 km upstream in 6 hours. If the speed of the stream is 4.8 km/h, then how much time (in hours) will the boat take to cover a distance of 279 km downstream?

SSC CGL 11/09/2024 (Shift-03)

(a) 20 (b) 15
(c) 18 (d) 16

30. A boat can travel 16.9 km downstream in 52 min. If the speed of the current is 3 km/h, then how much time (in hours) will the boat take to travel 84 km upstream?

SSC CPO 29/06/2024 (Shift-01)

(a) 6 (b) 13.5
(c) 6.22 (d) 7.5

31. A boatman goes 2 km against the current of the stream in 1 hour and goes 1 km along with the current in 10 minutes. How long will it take to go 6 km in still water?

SSC CGL 12/09/2024 (Shift-03)

(a) 1 hr 30 min (b) 1 hr 15 min
(c) 2 hr 30 min (d) 1 hr 45 min

32. Time taken by a boat to go a certain distance upstream is twice the time taken by it to go the same distance downstream. If the speed of the stream is 3 km/h, then how much time in hours will the boat take to go 52 km upstream?

SSC Phase IX 2022

(a) $4\frac{1}{3}$ (b) $5\frac{1}{5}$
(c) $5\frac{7}{9}$ (d) $8\frac{2}{3}$

33. A man can row a distance of 6 km in 1 hour in still water. He can row the same distance in 45 minutes with the current. Find the total time taken by him to row a distance of 16 km with the current and to return to the starting point.

SSC CGL 18/09/2024 (Shift-03)

(a) 4 h. & 40 m. (b) 6 h.
(c) 4 h. (d) 6 h. & 40 m.

34. A man takes 15 minutes to row 16 km downstream, which is 25% less than the time he takes to row the same distance upstream. How many kilometers can the man row in an hour in still water? (Rounded off to nearest whole number)

SSC CGL 14/07/2023 (Shift-04)

(a) 56 (b) 60
(c) 58 (d) 54

35. Time taken by boat to cover a distance of x km in upstream is 3 hrs more than the time taken by the boat to cover the same distance in downstream. Speed of the boat in upstream is 8 km/hr. Which of the following statement(s) is/are correct?

I. If the value of x is 48 km, then speed of boat in downstream is 16 km/hr.

II. If the speed of boat in downstream is 12 km/hr, then the value of x is 48 km.

SSC MTS 12/05/2023 (Shift-02)

(a) Neither I nor II (b) Only II
(c) Only I (d) Both I and II

• TYPE – II •

BASED ON: $\frac{B}{S} = \frac{T_2 + T_1}{T_2 - T_1}$

36. A boat covers a certain distance downstream in 2 hours, while it comes back in $2\frac{1}{2}$ hours. If the speed of the stream is 3 km/h, then what is the speed of the boat in still water ?

SSC Phase XII 24/06/2024 (Shift-03)

(a) 29 km/h (b) 25 km/h
(c) 20 km/h (d) 27 km/h

37. A motorboat takes 18 hours to go downstream, and it takes 36 hours to return the same distance. Find the ratio of the speed of the boat in still water to the speed of the stream.

SSC CGL 17/09/2024 (Shift-02)

(a) 3 : 1 (b) 2 : 3
(c) 2 : 1 (d) 3 : 2

38. A boat takes 11 hours to travel a distance upstream and takes 5 hours to travel the same distance downstream. if the speed of the boat in still water is $2\frac{2}{9}$ m/sec, then the speed of the stream (in km/h)is:

SSC CHSL 04/08/2023 (Shift-04)

(a) 2 (b) 3
(c) 1 (d) 4

39. The ratio of the speed of a boat to that of the current water is 35 : 8. The boat goes along with the current in 5 hours 10 minutes. What will be the time taken by the boat to come back?

SSC CPO 29/06/2024 (Shift-03)

(a) 5 hours 15 minutes 58 seconds
(b) 6 hours 45 minutes 10 seconds
(c) 8 hours 13 minutes 48 seconds
(d) 9 hours 30 minutes 49 seconds

40. The ratio of the speed of a motorboat to that of the current of water is 31:6. The motorboat starts from a point and covers a certain distance along the current in 4 h 10 min. Find the time taken by the motorboat to come back to its initial point.

SSC CGL 20/07/2023 (Shift-04)

(a) 4 h 10 min (b) 5 h 10 min
(c) 5 h 50 min (d) 6 h 10 min

41. The speed of a boat in still water is thrice the speed of the stream. If the boat takes 15.5 sec to go to a certain place downstream, then find the additional time required to cover the same distance travelling upstream.

SSC CPO 11/11/2022 (Shift-02)

(a) 15.5 sec (b) 29 sec
(c) 31 sec (d) 35 sec

◆ TYPE – III ◆
BASED ON: $T = \frac{2Dx}{x^2 - y^2}$

42. A motorboat, whose speed in 15 km/h in still water goes 50 km downstream and comes back in a total of 7 hours 30 minutes. The speed of the stream (in km/h) is?

SSC CGL 23/09/2024 (Shift-02)

(a) 9 km/h
(b) 5 km/h
(c) 11 km/h
(d) 7 km/h

43. A motorboat, whose speed is 20 km/h in still water goes 75 km downstream and comes back in a total of 8 hours. The speed of the stream is:

SSC Phase-XI 30/06/2023 (Shift-03)

(a) 5 km/h.
(b) 6 km/h.
(c) 4.5 km/h.
(d) 6.5 km/h.

44. The speed of boat in still water is 18 km/h and the speed of the current is 6 km/h. In how much time (in hours) will the boat travel a distance of 90 km upstream and the same distance downstream?

SSC CGL TIER-II 12/09/2019

(a) $9\frac{1}{2}$
(b) $11\frac{1}{4}$
(c) 12
(d) 10

45. A man can row 5 km/h in still water. If the speed of the current is 2.5 km/h, it takes 4 hours more in upstream than in the downstream for the same distance. The distance is:

SSC CHSL 24/05/2022 (Shift- 02)

(a) 10.5 km
(b) 15 km
(c) 7.5 km
(d) 12 km

◆ TYPE – IV ◆
BASED ON: $D = T\,\frac{B^2 - S^2}{2B}$

46. A motorboat, whose speed is 15 km/h in still water goes 20 km downstream and comes back in a total of 4 hours. The speed of the stream (in km/h) is:

SSC Phase XII 26/06/2024 (Shift-04)

(a) $7\sqrt{3}$
(b) $5\sqrt{3}$
(c) $4\sqrt{3}$
(d) $6\sqrt{3}$

47. In a stream running at 3 km/h, a motorboat goes 12 km upstream and back to the starting point in 60 min. Find the speed of the motorboat in still water, (in km/h)

SSC CGL 07/03/2020 (Shift- 03)

(a) $2\left(2+\sqrt{17}\right)$
(b) $2\left(4+\sqrt{15}\right)$
(c) $3\left(4+\sqrt{17}\right)$
(d) $3\left(2+\sqrt{17}\right)$

48. The speed of a boat in still water is 18 km/h and the speed of the stream is 3 km/h. How much time (in hours) will it take to cover a distance of 105 km in downstream and in coming back?

SSC CGL 10/09/2024 (Shift-03)

(a) 12
(b) 10
(c) 15
(d) 9

49. The speed of a boat in still water is 12 km/h, and the speed of the stream is 3 km/h. A man goes to a place by boat, 45 km and comes back to the starting point. Find the total time taken by him.

SSC CHSL 08/07/2024 (Shift-03)

(a) 6 hours
(b) 7 hours
(c) 9 hours
(d) 8 hours

50. The speed of a boat in a still river is 15 km/h and the speed of the current is 5 km/h. In what time (in hours) will the boat cover a distance of 60 kilometers downstream and the same distance upstream?

SSC CPO 25/11/2020 (Shift-03)

(a) 12
(b) 9
(c) 10
(d) 20

51. The speed of a boat in standing water is 6 km/h and the speed of the stream is 2.5 km/h. A man rows to a place at a distance of 59.5 km and comes back to the starting point. The total time taken by him is:

SSC CPO 04/10/2023 (Shift-01)

(a) 22 hours
(b) 18 hours
(c) 16 hours
(d) 24 hours

52. A boat racer can row $21\frac{3}{2}$ km/h in still water. If the speed of river is 12.5 km/h, it takes him 40 minutes to row to a place and back, how far off is the place (consider up to two decimals)?

SSC CGL 06/12/2022 (Shift- 01)

(a) $5\frac{5}{27}$ km
(b) $5\frac{5}{2}$ km
(c) $4\frac{5}{27}$ km
(d) $3\frac{5}{27}$ km

53. The speed of a boat in still water is 20 km/h, while the river is flowing at a speed of 8 km/h and the time taken to cover a certain distance upstream is 6 h more than the time taken to cover the same distance downstream. Find the distance.

SSC CPO 03/10/2023 (Shift-03)

(a) 126 km
(b) 125 km
(c) 120 km
(d) 336 km

54. A motorboat whose speed is 20 km/h in still water takes 30 minutes more to go 24 km upstream than to cover the same distance downstream. If the speed of the boat in still water is increased by 2 km/h, then how much time will it take to go 39 km downstream and 30 km upstream?

SSC CGL 13/12/2022 (Shift-01)

(a) 2 h 40 min
(b) 3 h 10 min
(c) 3 h 40 min
(d) 2 h 50 min

55. A boat sails downstream from a point P to point Q. Which is 24 km away from P, and then returns to P. If the actual speed of the boat (in still water) is 6 km/h. The entire trip from P to Q taken 3 hours less than what from Q to P. What should be the actual speed (in km/h) of the boat to sail from P to Q in 2 hours?

SSC MTS 08/10/2021 (Shift- 01)

(a) 12
(b) 15
(c) 10
(d) 22

◆ TYPE – V ◆
UV CONCEPT

56. A boat can go 40 km downstream and 25 km upstream in 7 hours 30 minutes. It can go 48 km downstream and 36 km upstream in 10 hours. What is the speed (in km/h) of the boat in still water?

SSC CPO 09/11/2022 (Shift-03)

(a) 6
(b) 12
(c) 9
(d) 15

57. A motorboat travelling at a certain speed can cover a distance of 24 km upstream and 40 km downstream in 17 hours. At the same speed it can travel 32 km downstream and 12 km upstream in 10 hours. What is the speed of the current?

SSC CGL 18/09/2024 (Shift-01)

(a) 5 km/h
(b) 4 km/h
(c) 2 km/h
(d) 3 km/h

58. A boat covers 24 km upstream and 36 km downstream in 10 hours, and 36 km upstream and 24 km down-stream in 12 hours. The speed of the current is:

SSC CPO 28/06/2024 (Shift-01)

(a) $\frac{26}{9}$ km/h
(b) $\frac{33}{13}$ km/h
(c) $\frac{25}{8}$ km/h
(d) $\frac{24}{7}$ km/h

59. A boat can go 60 km downstream and 40 km upstream in 12 hours 30 minutes. It can go 84 km downstream and 63 km upstream in 18 hours 54 minutes. What is the speed (in km/h, to the nearest integer) of the boat in still water?

SSC CGL 20/07/2023 (Shift-01)

(a) 7
(b) 8
(c) 9
(d) 10

60. A boat can go 15 km downstream and 8 km upstream in 2h. It can go 20 km downstream and 12 km upstream in 2h 50 min . What is the speed (in km/h) of the boat while going downstream?

SSC CHSL 12/08/2021 (Shift-01)

(a) 20
(b) 18
(c) 15
(d) 16

61. A boat can cover a distance of 7.2 km downstream and 3.2 km upstream in 2 hours. It can also cover 1.5 km downstream and 0.6 km upstream in 24 minutes. What is the speed of the boat when going downstream (in km/hr)?

SSC CGL 07/06/2019 (Shift- 01)

(a) 6
(b) $4\frac{1}{2}$
(c) 5
(d) $4\frac{1}{2}$

62. A boat can go 5 km upstream $7\frac{1}{2}$ km downstream in 45 minutes. It can also go 5 km downstream and 2.5 km upstream in 25 minutes. How much time (in minutes) will it take to go 6 km upstream ?

SSC CGL TIER-II 18/11/2020

(a) 30 (b) 24
(c) 36 (d) 32

63. A boat can go 5 km upstream and $7\frac{1}{2}$ km downstream in 45 minutes. It can also go 5 km downstream and 2.5 km upstream in 25 minute. How much time (in minutes) will it take to go 6 km downstream?

SSC CGL 20/08/2021 (Shift- 02)

(a) 20 (b) 10
(c) 15 (d) 12

64. A boat can go 3 km upstream and 5 km downstream in 55 minutes. It can also go 4 km upstream and 9 km downstream in 1 hour 25 minutes. In how much time (in hours) will it go 43.2 km downstream?

SSC CGL 04/03/2020 (Shift- 01)

(a) 4.8 (b) 5.4
(c) 3.6 (d) 4.4

65. A boat goes 27 km upstream and 33 km downstream in 6 hours. In the same time it can go 36 km upstream and 22 km downstream. How much time will it take to go 36 km upstream and 44 km downstream?

SSC CGL 16/08/2021 (Shift- 03)

(a) 8h (b) 8h 10 m
(c) 7h 50m (d) 8h 30 m

66. A boat can travel 78 km upstream and back in a total of 32 hours. It can travel 15 km upstream and 52 km downstream in a total of 9 hours. How much distance will the boat cover in 12 hours in still water?

SSC CGL 13/09/2024 (Shift-01)

(a) 92 km (b) 96 km
(c) 104 km (d) 100 km

67. Abhi rows upstream a distance of 28 km in 4h and rows downstream a distance of 50 km in 2h. To row a distance of 44.8 km in still water, he will take:

SSC CGL TIER-II 11/09/2019

(a) 3.2 hr (b) 2.2 hr
(c) 2.4 hr (d) 2.8 hr

68. A person rows upstream a distance of 55 km in 5 hours and rows downstream a distance of 75 km in 3 hours. How much time will he take to cover a distance of 96 km in still water?

SSC CHSL 16/04/2021 (Shift- 02)

(a) 4 hours 40 minutes
(b) 5 hours 20 minutes
(c) 6 hours 10 minutes
(d) 5 hours 45 minutes

69. A boat travels 3 km upstream in 1 h and 1 km downstream in 12 min. How much time will it take for the boat to go 6 km in still water?

SSC CHSL TIER-II 10/01/2024

(a) 1 h 30 min (b) 1 h 25 min
(c) 1 h 20 min (d) 1 h 15 min

• TYPE – VI •
MISCELLANEOUS QUESTIONS

70. A man can row a distance of 900 meters against the stream in 12 minutes and returns to the starting points in 9 minutes. What is the speed (in km/h) of the man in still water?

SSC CGL TIER-II 13/09/2019

(a) $4\frac{1}{2}$ (b) 6
(c) $5\frac{1}{4}$ (d) 5

71. A man's speed in still water is 4 km/h more than the speed of the current. If the man takes a total of 10 h to cover 45 km downstream and 35 km upstream, then the speed of the man in still water is:

SSC CPO 27/06/2024 (Shift-03)

(a) 20 km/h (b) 18 km/h
(c) 15 km/h (d) 22 km/h

72. The speed of a boat in still water is 6 km/h and the speed of the stream is 1.5 km/h. In going from point A to point B and returning to A, the boatman takes 2 hours 40 min. Find the distance between points A and B.

SSC Phase XII 24/06/2024 (Shift-02)

(a) 7.5 km (b) 7 km
(c) 8 km (d) 8.5 km

73. A swimmer swims from a point P against the current for 6 min and then swims back along the current for next 6 min and reaches at a point Q. If the distance between P and Q is 120 m then the speed of the current (in km/h) is:

SSC CGL 01/12/2022 (Shift-03)

(a) 0.4 (b) 0.2
(c) 1 (d) 0.6

74. A boat takes 20 hours for travelling downstream from point A to point B and comes back to a midpoint C between A and B. The speed of the stream is 5 km/h and the speed of the boat in still water is 10 km/h. Find the distance between A and B (in km).

SSC MTS 01/09/2023 (Shift-01)

(a) 100 (b) 150
(c) 75 (d) 120

75. A boat covers a round trip journey between two points A and B in a river in T hours. If its speed in still water becomes 2 times, it would take $\frac{80}{161}$ T hours for the same journey. Find the ratio of its speed in still water to the speed of the river.

SSC CGL 23/08/2021 (Shift- 01)

(a) 11 : 1 (b) 161 : 40
(c) 1 : 11 (d) 2 : 1

76. A person rowing a boat goes from J to K (upstream) and returns from K to J (downstream) in a total time of 15 hours. The distance between J and K is 300 AU. The time taken by a man to row a boat a distance of 9 km downstream is equal to the time taken by him to row a boat a distance of 3 km upstream. What is the approximate speed of the boat in still water?

SSC MTS 12/07/2022 (Shift-03)

(a) 51.33
(b) 47.67
(c) 53.33
(d) 43.67

77. X, Y are two points in a river. Point P and Q divide the straight line XY into three equal parts. The river flows along XY and the time taken by a boat to row from X to Q and from Y to Q are in the ratio 4 : 5. The ratio of the speed of the boat downstream to that of the river current is equal to:

SSC CGL 13/08/2021 (Shift- 01)

(a) 3 : 10
(b) 3 : 4
(c) 10 : 3
(d) 4 : 3

ANSWER KEY

1.	(c)	2.	(d)	3.	(a)	4.	(a)	5.	(d)	6.	(c)	7.	(c)	8.	(b)	9.	(d)	10.	(c)
11.	(b)	12.	(a)	13.	(a)	14.	(d)	15.	(c)	16.	(c)	17.	(b)	18.	(d)	19.	(c)	20.	(b)
21.	(b)	22.	(c)	23.	(c)	24.	(b)	25.	(a)	26.	(d)	27.	(c)	28.	(c)	29.	(b)	30.	(c)
31.	(a)	32.	(d)	33.	(b)	34.	(a)	35.	(c)	36.	(d)	37.	(a)	38.	(b)	39.	(c)	40.	(d)
41.	(a)	42.	(b)	43.	(a)	44.	(b)	45.	(b)	46.	(b)	47.	(c)	48.	(a)	49.	(d)	50.	(b)
51.	(d)	52.	(a)	53.	(a)	54.	(b)	55.	(c)	56.	(c)	57.	(d)	58.	(c)	59.	(c)	60.	(c)
61.	(a)	62.	(c)	63.	(d)	64.	(c)	65.	(a)	66.	(b)	67.	(d)	68.	(b)	69.	(a)	70.	(c)
71.	(a)	72.	(a)	73.	(d)	74.	(d)	75.	(a)	76.	(c)	77.	(c)						

SOLUTIONS

Speed of the boat downstream = X + Y
Speed of the boat Upstream = X – Y
Speed of the boat downstream = D
Speed of the boat upstream = U

1. (c) Upstream speed = B – S = 9 – 5
= 4 km/hr.
Downstream speed = B + S = 9 + 5
= 14 km/hr.

2. (d) Let, Speed of stream = y km/hr.
Speed of boat in still water (x) = 3 km/hr.
Upstream speed = (x – y) = 1km/hr.
ATQ,
$x - y = 1 \Rightarrow 3 - y = 1 \Rightarrow y = 2$
∴ Speed of stream = 2 km/hr.

3. (a) Let, Speed of boat = x,
Speed of stream = y
Then,
Downstream = $x + y$
Upstream = $x - y$
A.T.Q.,

$$x + y = \frac{2}{10} \times 60 = 12 \text{ km/h.}$$

$$x - y = \frac{12}{2} = 6 \text{ km/h.}$$

Speed of stream = $\frac{12-6}{2}$ = 3 km/h.

Hence, Speed of stream = 3 km/h.

4. (a) Downstream speed = $x + y$
Upstream speed = $x - y$
Now,

$$x + y = \frac{55}{5} = 11 \text{ km/h} \quad \text{......(i)}$$

$$x - y = \frac{55}{11} = 5 \text{ km/h} \text{.....(ii)}$$

From (i) and (ii), we get
$2x$ = 16 km/h
⇒ x = 8 km/h
∴ Speed of Boat = 8 km/h

5. (d) Let, Speed of boat = x,
Speed of stream = y
Then,
Speed of boat (downstream)
= $x + y = 33$
Speed of boat (upstream) = $x - y = 27$
A.T.Q.,

∴ Speed of boat = $\frac{33+27}{2}$ = 30 km/h

6. (c) Given,
Speed in upstream (x – y) = 32 km/h.
Speed in downstream (x+ y) = 48 km/h.

∴ Speed of boat (x) = $\frac{48+32}{2}$ = 40 km/h.

7. (c) Relative speed of both boats
= (35 – 25) = 10 km/h
Time taken by both the boats to meet
= $\frac{60}{10}$ = 6 hrs.

8. (b) Let, speed of boat in still water
= x km/hr
Speed of stream = y km/hr.

Upstream : Downstream
(x – y) : (x+y)

$$\text{Speed} \rightarrow \underbrace{2 \quad : \quad 3}_{\text{Sum}}$$

5 unit → 15
1 unit → 3

Now,
$x - y = 6$ ....(i)
$x + y = 9$ ....(ii)
ATQ,
From (i) and (ii), y = 1.5 km/hr
Speed of stream = y = 1.5km/hr

9. (d) Since distance is same, then speed and time ratio be in inverse
Down stream : Up stream
Time → 7 : 10
Speed → 10 : 7
Speed of boat : Speed of stream
$\frac{10+7}{2}$: $\frac{10-7}{2}$
17 : 3

Alternate Method:-

$$\frac{B}{S} = \frac{T_2 + T_1}{T_2 - T_1} = \frac{10+7}{10-7} = \frac{17}{3}$$

10. (c) Let, Speed of boat in still water = x km/h
Speed of stream = y km/h
Distance = Speed × Time
Downstream : Upstream
(x + y) : (x – y)
Time → 1 : 3
Speed → 3 : 1

$$\frac{x+y}{x-y} = \frac{3}{1} \Rightarrow \frac{x}{y} = \frac{2}{1}$$

2 unit → $\frac{16}{3}$ km/h

1 unit → $\frac{8}{3}$ km/h = $\frac{8}{3} \times \frac{5}{18} = \frac{20}{27}$ m/s

11. (b) Let, speed of man in still water = x km/hr
Speed of stream = y km/hr
When distance is constant then,

Time ∝ $\frac{1}{\text{Speed}}$

ATQ,
upstream : Downstream
(x – y) : (x+y)
Time → 2 : 1
Speed → 1 : 2

$x = \frac{1+2}{2}$ = 1.5 units and
y = 0.5 unit
1.5 units → 18 km/hr
0.5 unit → 6 km/hr
∴ Speed of stream = 6 km/hr

12. (a) Let, Speed of boat in still water = x km/hr
Speed of stream = y km/hr
When distance is constant then,

Time ∝ $\frac{1}{\text{Speed}}$

ATQ,
Upstream : Downstream
(x – y) : (x + y)
Time → 3 : 1
Speed → 1 : 3

$x = \frac{1+3}{2}$ = 2 units and
y = 1 unit
2 units → 8 km/hr
1 unit → 4 km/hr
∴ Speed of stream = 4 km/hr

13. (a) Let speed of boat in still water = x km/h
Speed of stream = y km/h
Distance = Speed × Time
Downstream : Upstream
Time → 1 : 2
Speed → 2 : 1
Boat : Stream
Speed → $\frac{3}{2}$: $\frac{1}{2}$
3 : 1

∴ Speed of stream = $\frac{90}{4}$ × 1
= 22.5 km/h

14. (d) Let, the speed of boat = x km/h
Speed of stream = y km/h

$$\frac{x+y}{x-y} = \frac{4}{3} \Rightarrow x = 7y$$

ATQ,

$$\frac{48}{x+y} + \frac{48}{x-y} = 14 \Rightarrow \frac{48}{8y} + \frac{48}{6y} = 14$$

$$\Rightarrow \frac{6}{y} + \frac{8}{y} = 14$$

⇒ y = 1 km/hr.

15. (c) Given,
Downstream : Upstream
(x + y) : (x – y)
Speed → 2.5 : 1
= 5 : 2

$$\frac{D}{U} = \frac{5x}{2x}$$

ATQ,

$$\frac{30}{5x} + \frac{30}{2x} = 7 \text{ hrs}$$

⇒ Here x = 3 satisfies
So, Downstream speed = $5x$ = 5 × 3
= 15 km/h

16. (c) Downstream : Upstream
(x + y) : (x – y)
Speed → 5 : 2
ATQ,

$$\frac{80}{5x} + \frac{50}{2x} = 8.2$$

By solving, x = 5
∴ Speed of boat in downstream
(D) = $5x$ = 5 × 5 = 25 km/h.

17. (b) Let,
Speed of boat in still water = x km/h
Speed of stream = y km/h
Speed of boat in downstream = (x + y)
Speed of boat in upstream = (x – y)
ATQ,
Downstream speed : Speed of boat
= (x + y) : x = 5 : 4
Then, y = 1

$$x = \frac{20}{\frac{1}{2}} = 40 \text{ km/h}$$

∵ 4 unit → 40 km/h
1 unit → 10 km/h
Speed of stream (y) = 10 km/h

∵ Time = $\frac{15}{x-y} = \frac{15}{40-10} = \frac{1}{2}$ hour

18. (d)

Speed of boat (x) : Speed of stream (y)

8 : 3

$\Rightarrow 8k + 3k = \frac{22}{24} \times 60$

$\Rightarrow k = 5$

$(x) \rightarrow 8k = 40$ km/h

$(y) \rightarrow 3k = 15$ km/h

Time $= \frac{50}{40-15} = \frac{50}{25} = 2$ hrs

Hence, time taken by boat when going upstream = 2 hr.

19. (c) Speed of boat in upstream

$= \frac{5}{\frac{1}{4}} = 20$ km/h

Ratio of speed of boat in still water to speed of stream $= 6x : x$

Then the ratio of downstream to upstream will be

$= (6+1)x : (6-1)x = 7x : 5x$

$5x \rightarrow 20$ km/hr

$7x \rightarrow 28$ km/hr

Required time $= \frac{19.6}{28} \times 60$

$= 42$ min

20. (b) $S_B = 25$ km/hr.

Let distance = D

$\frac{D}{S_B} = \frac{4}{3} \times \frac{D}{S_B + S_C}$

$S_C = \frac{25}{3}$ km/h

$\therefore T = \frac{75}{25 + \frac{25}{3}} = \frac{3 \times 3}{4} =$ 2.25 hours

Alternate Method:

Let, Speed of boat in still water $= x$ km/h

Speed of stream = y km/h

x : $x + y$

Time → 4 : 3

Speed → 3 : 4

$\downarrow$ $\downarrow$

25 $\frac{100}{3}$

Time taken to go 75 km downstream

$= \frac{75}{\frac{100}{3}} = \frac{9}{4} = 2.25$ hrs.

21. (b) Let, Speed of boat in still water $= x$ km/hr

Speed of stream = y km/hr

$x + y$: $x - y$

Speed/dis. → 10 : 4

5 : 2

Time → 2 : 5

×2 ×2

7 unit → 14 hrs.

4 hrs. 10 hrs.

ATQ,

Downstream speed $(x + y) = \frac{30}{4}$

$= 7.5$ km/hr.

Upstream speed $(x - y) = \frac{30}{10}$

$= 3$ km/hr.

$\therefore$ Speed of stream $= \frac{1}{2}$ (D.S − U.S)

$= \frac{1}{2}(7.5 - 3) = \frac{4.5}{2} = \frac{9}{4}$ km/hr.

22. (c) Ratio of speed $= 4x : 3x$

ATQ,

$\frac{48}{4x} + \frac{48}{3x} = 48$

$\Rightarrow \frac{48 \times 7x}{12x^2} = 48 \Rightarrow x = \frac{7}{12}$

Speed of stream $= \frac{4x - 3x}{2} = 0.5x$

$= 0.5 \times \frac{7}{12} = \frac{7}{24}$ km/h

23. (c) Let, Speed of stream $= x$ km/h

Speed of boat in still water = 7.5 km/h

$\frac{4d}{7.5 + x} = \frac{d}{7.5 - x}$

$\Rightarrow 30 - 4x = 7.5 + x$

$\Rightarrow 5x = 22.5 \Rightarrow x = 4.5$

Speed of stream = 4.5 km/hr.

24. (b) Let, Speed of man $= x$ km/h.

Speed of stream = y km/h.

Then,

Downstream $= (x + y)$ km/h.

Upstream $= (x - y)$ km/h.

ATQ,

$x = \frac{1000}{12 \times 60} = \frac{1000}{720}$ m/s

$= \frac{1000}{720} \times \frac{18}{5} = 5$ km/h

$\therefore \frac{1}{5 - y} = \frac{13}{60}$

$\Rightarrow 60 = 65 - 13y$

$\Rightarrow y = \frac{5}{13}$ km/h

25. (a) Let speed of stream = y km/hr.

Speed of boat in still water (x) = 13 km/hr.

ATQ,

Downstream speed $= (x + y) = \frac{60}{4}$

$= 15$ km/hr.

y = 15 − 13 = 2 km/hr.

$\therefore$ Time taken to cover 30 km upstream

$= \frac{30}{13 - 2} = \frac{30}{11} = 2\frac{8}{11}$ hrs.

26. (d) Downstream = 19 + 3 = 22 km/h

Upstream = 19 − 3 = 16 km/h

Time $= t_D + t_U$

$= \frac{88}{22} + \frac{24}{16} = 5.5$ hrs.

27. (c) Speed of person

$= 5$m/sec. $= 5 \times \frac{18}{5} = 18$ km/h

Speed of stream = 6 km/h.

Speed in downstream

= Boat speed + stream speed

= 18 + 6= 24 km/h

Time $= \frac{\text{Distance}}{\text{Speed}} = \frac{76.8}{24}$

= 3.2 hours

28. (c) Speed of stream (y) = 2 km/h

Speed of boat $= x$ km/h

Up stream $= \frac{20 \times 60}{75}$

$\Rightarrow (x - 2) = 16$

$\Rightarrow x = 18$ km/h

Time $= \frac{30}{18 + 2} = \frac{3}{2} = 1.5$ hr

= 1 h 30 min

29. (b) Let, speed of boat $= x$ km/h

Speed of stream = 4.8 km/h

ATQ,

$\frac{54}{x - 4.8} = 6$

$\Rightarrow x = 13.8$

$\therefore$ Time taken by boat to cover 279 km

downstream $= \frac{279}{13.8 + 4.8}$

$= \frac{279}{18.6} = 15$ hours

30. (c) Speed of boat (downstream)

$= \frac{16.9}{52} \times 60 = 19.5$ km/h

Speed of boat in still water

= 19.5 − 3 = 16.5 km/h

Time taken by boat (upstream)

$= \frac{84}{16.5 - 3} = \frac{84}{13.5} = 6.22$ hrs

31. (a) Let, Speed of boatman in still water $= x$ km/hr.

Speed of stream = y km/hr.

Upstream speed $(x - y) = \frac{2}{1}$

$= 2$ km/hr.

Downstream speed $(x + y)$

$= \frac{1}{10} \times 60 = 6$ km/hr.

$\therefore x = \frac{2 + 6}{2} = 4$ km/hr.

$\therefore$ Time taken by boatman to go 6 km.

in still water $= \frac{6}{4} = 1\frac{1}{2}$ hr.

= 1 hr. 30 min.

32. (d) Speed of boat $= S_B$

Speed of current $= S_C$

ATQ,

$\frac{D}{S_B + S_C} = \frac{1}{2}\left(\frac{D}{S_B - S_C}\right)$

$\Rightarrow S_B = 3S_C$

$\Rightarrow S_B = 9$ km/h

$\therefore T = \frac{52}{9 - 3} = \frac{52}{6} = 8\frac{2}{3}$ hours

Alternate Method:

Downstream : Upstream

$(x + y)$: $(x - y)$

Time → 1 : 2

Speed → 2 : 1

Speed of boat : Speed of stream

$\frac{2+1}{2}$: $\frac{2-1}{2}$

1.5 : 0.5

0.5 unit → 3 km/hr

1 unit → 6 km/hr

Time taken to go 52 km upstream

$= \frac{52}{6} = 8\frac{2}{3}$ hours

33. (b) Let, Speed of stream = y km/hr.
Speed of boat in still water (x)
$= \frac{6}{1} = 6$ km/hr.
ATQ,
Downstream speed $(x + y) = \frac{6}{45} \times 60$
= 8 km/hr.
$\Rightarrow y = 8 - 6 = 2$ km/hr.
Upstream speed $(x - y) = 6 - 2$
= 4 km/hr.
Time $= \frac{16}{8} + \frac{16}{4} = 2 + 4 = 6$ hrs.

34. (a) Downstream speed $= \frac{16}{15} \times 60$
= 64 km/h
Time taken in upstream
$= 15 \times \frac{4}{3} = 20$ min
Speed of upstream $= \frac{16}{20} \times 60$
= 48 km/h
∴ Speed in still water
$= \frac{64 + 48}{2} = \frac{112}{2} = 56 \text{km/h}$

35. (c) Let, speed of boat upstream
= 8 kmph and
speed of boat downstream = y
ATQ,
$\frac{x}{8} = \frac{x}{y} + 3$
Checking statements given:
I: $\frac{48}{8} = \frac{48}{y} + 3$
$3 = \frac{48}{y} \Rightarrow y = 16$ kmph
Hence, I is true
II: Since, the equation is satisfied when, y = 16
and $x = 48$
Hence, statement II is incorrect
∴ Only I is correct.
∴ speed of stream = 5 km/h

36. (d) Let, Speed of Boat = x km/h.
Speed of stream (y) = 3 km/h.
∵ Distance = Speed × Time
ATQ,
$\therefore (x + y) \times 2 = (x - y) \times \frac{5}{2}$
$\Rightarrow 4(x + y) = 5(x - y)$
$\Rightarrow 9y = x$
$\Rightarrow x = 27$ km/h
∴ Speed of Boat = 27 km/h.

Alternate Method:-

Speed of boat in still water
$= \frac{S(T_2 + T_1)}{T_2 - T_1}$
$= \frac{3(2.5 + 2)}{2.5 - 2} = \frac{3 \times 4.5}{0.5} = 27$ km/hr.

37. (a) Given, Time $\propto \frac{1}{\text{Speed}}$

	Down	:	Up
Time →	18:		36
Speed →	36	:	18
Speed →	2	:	1

ATQ,
$\Rightarrow \frac{x + y}{x - y} = \frac{2}{1}$ (from C & D)
$\Rightarrow \frac{x}{y} = \frac{3}{1}$
Hence, required ratio = 3 : 1

Alternate Method:-

$\frac{B}{S} = \frac{(T_2 + T_1)}{T_2 - T_1} = \frac{36 + 18}{36 - 18}$
$= \frac{54}{18} = \frac{3}{1}$

38. (b) ATQ,

	Downstream	:	Upstream
Time →	5	:	11
Speed →	11	:	5

Speed of boat $= \frac{11 + 5}{2} = 8$ unit
Speed of stream $= \frac{11 - 5}{2} = 3$ unit
8 unit $\rightarrow \frac{20}{9} \times \frac{18}{5}$
8 unit → 8 km/h
∴ Speed of stream (3 unit) = 3 km/h

Alternate Method:-

Speed of boat in still water
$= \frac{S(T_2 + T_1)}{T_2 - T_1}$
$\Rightarrow 2\frac{2}{9} \times \frac{18}{5} = \frac{S(11+5)}{11-5}$
$\Rightarrow \frac{20}{9} \times \frac{18}{5} = \frac{16S}{6}$
$\Rightarrow 48 = 16S$
$\Rightarrow S = 3$ km/hr.

39. (c) Speed of boat (Downstream)
= 35 + 8 = 43
Speed of boat (Upstream)
= 35 − 8 = 27
If distance is constant then,
Time $\propto \frac{1}{\text{Speed}}$

	Downstream	:	Upstream
Speed →	43	:	27
Time →	27	:	43
	↓		↓
	310min [5h+30min=310min]		8h:13min:48sec

Alternate Method:-

$\frac{B}{S} = \frac{T_2 + T_1}{T_2 - T_1}$
$\Rightarrow \frac{35}{8} = \frac{T_2 + 310}{T_2 - 310}$
$\Rightarrow 35T_2 - 10850 = 8T_2 + 2480$
$\Rightarrow 27T_2 = 13330$
$\Rightarrow T_2 = 493.7$ min
= 8 hrs 13 min 48 sec

40. (d) U = upstream speed,
D = downstream speed
When distance is constant
Speed $\propto \frac{1}{\text{Time}}$

	D	:	U
Speed →	37	:	25
Time →	25	:	37
	↓		↓
	4h 10 m		$\frac{25}{6} \times \frac{1}{25} \times 37$ = 6 h10 min

Alternate Method:-

$\frac{B}{S} = \frac{T_2 + T_1}{T_2 - T_1}$
$\Rightarrow \frac{31}{6} = \frac{T_2 + 250}{T_2 - 250}$
$\Rightarrow 31T_2 - 7750 = 6T_2 + 1500$
$\Rightarrow 25T_2 = 9250$
$\Rightarrow T_2 = 370$ min = 6 hrs 10 min

41. (a)

	x	:	y
Speed →	3	:	1
	D	:	U
	4	:	2
Speed →	2	:	1
Time →	1	:	2

$$1 \text{ unit} \xrightarrow{\times 15.5} 15.5 \text{ sec}$$
$$15.5\times \downarrow$$
15.5 sec

Alternate Method:

$\frac{B}{S} = \frac{T_2 + T_1}{T_2 - T_1}$
$\Rightarrow \frac{3}{1} = \frac{T_2 + 15.5}{T_2 - 15.5}$
$\Rightarrow 3T_2 - 46.5 = T_2 + 15.5$
$\Rightarrow 2T_2 = 62$
$\Rightarrow T_2 = 31$
Additional time = 31 − 15.5
= 15.5 sec.

42. (b) Let speed of stream = y km/hr,
speed of boat = x km/hr
ATQ,
$\frac{2xd}{x^2 - y^2} = t$
$\Rightarrow \frac{2 \times 15 \times 50}{15^2 - y^2} = \frac{15}{2}$
$\Rightarrow 225 - y^2 = 200$
$\Rightarrow y = 5$
∴ Speed of stream = 5km/h

Alternate Method:-

Given,
x = 15 km/h
Let, speed of stream = y km/h
ATQ,
$\frac{50}{15 + y} + \frac{50}{15 - y} = \frac{15}{2}$
$\Rightarrow 2[50(15 - y) + 50(15 + y)] = 15(225 - y^2)$
$\Rightarrow 2[750 - 50y + 750 + 50y] = 15(225 - y^2)$
$\Rightarrow 2 \times 1500 = 15(225 - y^2)$
$\Rightarrow y^2 = 225 - 200$
$\Rightarrow y = 5$
∴ Speed of stream (y) = 5 km/h

43. (a) ATQ,
$\frac{75}{20 + x} + \frac{75}{20 - x} = 8$

Put the value of x from option (a)
We get,
$3 + 5 = 8$
LHS = RHS
∴ Speed of stream = 5 km/h

Alternate Method:

Let, speed of stream = y

$$\text{Time} = \frac{\text{Distance} \times 2 \times \text{Speed of Boat}}{(\text{Speed of Boat})^2 - (\text{Speed of Stream})^2}$$

$$\Rightarrow 8 = \frac{75 \times 2 \times 20}{400 - y^2} \Rightarrow y^2 = 25 \Rightarrow y = 5$$

Hence, speed of stream = 5 km/h

44. (b) Time = $T_U + T_D$

$$T = \frac{2Dx}{x^2 - y^2} = \frac{2 \times 90 \times 18}{12 \times 24}$$

$$= \frac{45}{4} = 11\frac{1}{4} \text{ hrs.}$$

45. (b) Let the distance be D.

$$\frac{D}{5 - 2\cdot5} - \frac{D}{5 + 2\cdot5} = 4$$

$$\Rightarrow \frac{D}{2\cdot5} - \frac{D}{7\cdot5} = 4$$

$$\Rightarrow D\left[\frac{3-1}{7.5}\right] = 4 \Rightarrow D = 15 \text{ km.}$$

Alternate Method:

$$T = \frac{2dy}{(x^2 - y^2)}$$

$$\Rightarrow 4 = \frac{2 \times d \times 2.5}{7.5 \times 2.5} \Rightarrow d = 15 \text{ km.}$$

46. (b) Let, speed of stream = y km/h
Downstream speed = (15 + y) km/h
Upstream speed = (15 – y) km/h

$$\because \text{Time} = \frac{\text{Distance}}{\text{speed}}$$

ATQ,

$$\frac{20}{15 + y} + \frac{20}{15 - y} = 4$$

$$\Rightarrow 20\left(\frac{15 - y + 15 + y}{15^2 - y^2}\right) = 4$$

$$\Rightarrow 225 - y^2 = 5 \times 30$$
$$\Rightarrow -y^2 = 150 - 225$$
$$\Rightarrow y^2 = 75 \Rightarrow y = 5\sqrt{3}$$

Alternate Method:

$$D = \frac{T(B^2 - S^2)}{2B}$$

$$\Rightarrow 20 = \frac{4(15^2 - S^2)}{2 \times 15}$$

$$\Rightarrow 150 = 225 - S^2$$
$$\Rightarrow S^2 = 75$$
$$\Rightarrow S = 5\sqrt{3} \text{ km/hr}$$

47. (c) Let speed of motorboat = x

$$\frac{12}{x + 3} + \frac{12}{x - 3} = \frac{60}{60}$$

$$\Rightarrow \frac{12(x - 3 + x + 3)}{x^2 - 9} = 1$$

$$\Rightarrow x^2 - 9 - 24x = 0$$
$$\Rightarrow x^2 - 24x - 9 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-24) \pm \sqrt{(-24)^2 - 4 \times 1 \times (-9)}}{2 \times 1}$$

$$= \frac{24 + 6\sqrt{17}}{2}$$

$$= 12 + 3\sqrt{17} = 3(4 + \sqrt{17}) \text{ km/h}$$

Alternate Method:-

$$D = \frac{T(B^2 - S^2)}{2B}$$

$$\Rightarrow 12 = \frac{1(B^2 - 9)}{2B}$$

$$\Rightarrow B^2 - 24B - 9 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-24) + \sqrt{(-24)^2 - 4 \times 1 \times (-9)}}{2 \times 1}$$

$$= \frac{24 + 6\sqrt{17}}{2}$$

$$= 12 + 3\sqrt{17} = 3(4 + \sqrt{17}) \text{ km/h}$$

48. (a) Speed of boat in still water (x) = 18 km/hr.
Speed of stream (y) = 3 km/hr.
Downstream speed (x + y) = 18 + 3 = 21 km/hr.
Upstream speed (x – y) = 18 – 3 = 15 km/hr.
ATQ,

$$\text{Time} = \frac{105}{21} + \frac{105}{15} = 5 + 7 = 12 \text{ hrs.}$$

∴ Required time = 12 hrs.

Alternate Method:-

$$D = \frac{T(B^2 - S^2)}{2B}$$

$$\Rightarrow 105 = \frac{T(18^2 - 3^2)}{2 \times 18}$$

$$\Rightarrow T = \frac{105 \times 36}{21 \times 15} = 12 \text{ hrs.}$$

49. (d) Speed of boat in still water (x) = 12 km/hr.
Speed of stream (y) = 3 km/hr.
ATQ,

$$\text{Total time taken} = \frac{45}{x + y} + \frac{45}{x - y}$$

$$= \frac{45}{15} + \frac{45}{9}$$

= 3 + 5 = 8 hrs.

Alternate Method:-

$$D = \frac{T(B^2 - S^2)}{2B}$$

$$\Rightarrow 45 = \frac{T(12^2 - 3^2)}{2 \times 12}$$

$$\Rightarrow T = \frac{45 \times 24}{15 \times 9} = 8 \text{ hrs.}$$

50. (b) Speed of boat in still water = 15 km/h
Speed of stream = 5 km/h
Speed of boat in downstream = 15 + 5 = 20 km/h
Speed of boat in upstream = 15 – 5 = 10 km/h

$$\text{Total Time} = \frac{60}{20} + \frac{60}{10} = 3 + 6 =$$

9hrs.

Alternate Method:-

$$D = \frac{T(B^2 - S^2)}{2B}$$

$$\Rightarrow 60 = \frac{T(15^2 - 5^2)}{2 \times 15}$$

$$\Rightarrow 1800 = T(225 - 25)$$
$$\Rightarrow T = 9 \text{ hr}$$

51. (d) Speed of boat in still water (x) = 6 kmph
Speed of stream (y) = 2.5 kmph
ATQ,

$$\frac{59.5}{6 + 2.5} + \frac{59.5}{6 - 2.5} = \text{Time}$$

$$\Rightarrow 59.5\left[\frac{1}{8.5} + \frac{1}{3.5}\right] = \text{Time}$$

$$\Rightarrow \frac{59.5 \times 12}{8.5 \times 3.5} = \text{Time}$$

$$\Rightarrow \text{Time} = 24 \text{ hrs}$$

Alternate Method:

$$T = \frac{2B}{B^2 - S^2} \times D = \frac{2 \times 6 \times 59.5}{8.5 \times 3.5} = 24 \text{ h}$$

52. (a) Boat (x) = $\frac{45}{2}$ = 22.5 km/h
Stream (y) = 12.5 km/h

$$D = \frac{T(B^2 - S^2)}{2B}$$

$$= \frac{40 \times 35 \times 10}{60 \times 2 \times 22.5}$$

$$= \frac{140}{27} = 5\frac{5}{27} \text{ km/h}$$

53. (a) Let, the required distance be 'D' kms
Speed of boat in still water (x) = 20 km/hr
Speed of stream (y) = 8 kmph
ATQ,

$$\frac{D}{x - y} - \frac{D}{x + y} = 6$$

$$\Rightarrow \frac{D}{12} - \frac{D}{28} = 6$$

$$\Rightarrow D \times 16 = 6 \times 12 \times 28$$

∴ D = 126 km

Alternate Method:

$$D = \frac{T(B^2 - S^2)}{2S}$$

$$= \frac{6 \times (20^2 - 8^2)}{2 \times 8} = \frac{6 \times 28 \times 12}{2 \times 8} = 126 \text{ km}$$

54. (b) $D = \frac{T(B^2 - S^2)}{2S}$

$$\Rightarrow 24 = \frac{\frac{30}{60}(20^2 - S^2)}{2S}$$

$$\Rightarrow 96S = 400 - S^2$$
$$\Rightarrow S^2 + 96S - 400 = 0$$
$$\Rightarrow S = 4 \text{ km/hr}$$

$$\text{Time} = \frac{39}{22 + 4} + \frac{30}{22 - 4}$$

$$= \frac{3}{2} + \frac{5}{3} = \frac{19}{6} = 3 \text{ hours } 10 \text{ minutes}$$

55. (c) Let, the actual speed of boat = v km/h
ATQ,

$$\frac{24}{6 - x} - \frac{24}{6 + x} = 3$$

$$\Rightarrow x^2 + 16x - 36 = 0$$
$$\Rightarrow x^2 + 18x - 2x - 36 = 0$$
$$\Rightarrow x = 2$$

$$\therefore \frac{24}{2} = v + 2$$

$$\Rightarrow v = 10 \text{ km/hr}$$

Alternate Method:-

$$D = \frac{T(B^2 - S^2)}{2S}$$

$$\Rightarrow 24 = \frac{3(6^2 - S^2)}{2S}$$

$\Rightarrow 16S = 36 - S^2$

$\Rightarrow S^2 + 16S - 36 = 0$

$\Rightarrow S = 2$ km/hr

$\therefore \frac{24}{2} = B + 2$

$\Rightarrow B = 10$ km/hr

56. (c) Let, Speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$40D + 25U = 7.5 \text{ hrs}_{\times 6}$

$48D + 36U = 10 \text{ hrs}_{\times 5}$

$240D + 150U = 45$ hrs

$\underline{\overset{-}{}240D \overset{-}{+} 180U = \overset{-}{}50 \text{ hrs}}$

$30U = 5$

$U = \frac{1}{6} \Rightarrow x - y = 6$

Now, $48D + 36 \times \frac{1}{6} = 10 \Rightarrow 48D = 4$

$\Rightarrow D = \frac{1}{12} \Rightarrow x + y = 12$

$\frac{x+y}{x-y} = \frac{12}{6} \Rightarrow x = 9$ km/h

$\therefore$ Speed of boat = 9 km/h

57. (d) Let, Speed of boat = x

Speed of stream = y

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

ATQ.

$40D + 24U = 17 \, ._1$

$32D + 12U = 10 \, ._2$

$40D + 24U = 17$

$\underline{\overset{-}{}64D \overset{-}{+} 24U = \overset{-}{20}}$

$24D = 3$

$\Rightarrow D = \frac{3}{24} = \frac{1}{8} \Rightarrow x + y = 8$

Now,

$\Rightarrow 40 \times \frac{1}{8} + 24U = 17$

$\Rightarrow 24U = 12$

$\Rightarrow U = \frac{1}{2} \Rightarrow x - y = 2$

Then,

$y = \frac{8-2}{2} = 3$ km/hr.

Hence, Speed of stream = 3 km/h

58. (c) Let, Speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$36D + 24U = 10 \text{ hrs.}_{\times 2}$

$24D + 36U = 12 \text{ hrs.}_{\times 3}$

$72D + 48U = 20$ hrs.

$\underline{\overset{-}{}72D \overset{-}{+} 108U = \overset{-}{}36 \text{ hrs.}}$

$60U = 16$ hrs.

$U = \frac{4}{15} \Rightarrow x - y = \frac{15}{4}$

$36D + 24 \times \frac{4}{15} = 10$

$\Rightarrow 36D = 10 - \frac{96}{15} \Rightarrow 36D = \frac{54}{15}$

$\Rightarrow D = \frac{1}{10} \Rightarrow x + y = 10$

$\therefore$ Speed of current(y) $= \frac{1}{2}\left[10 - \frac{15}{4}\right]$

$= \frac{25}{8}$ km/h

59. (c) Let speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$60D + 40U = 12.5 \text{ hrs}_{\times 1.4}$

$84D + 63U = \frac{189}{10}$ hrs

$84D + 56U = \frac{175}{10}$ hrs

$\underline{\overset{-}{}84D \overset{-}{+} 63U = \frac{189}{-10} \text{ hrs}}$

$7U = \frac{14}{10}$

$U = \frac{1}{5} \Rightarrow x - y = 5$

Now, $60D + 40 \times \frac{1}{5} = 12.5$

$D = \frac{3}{40} \Rightarrow x + y = \frac{40}{3}$ km/h

Speed of boat in still water

$= \frac{\frac{40}{3} + 5}{2} = \frac{55}{6} \sim 9$ km/h

60. (c) Let speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$15D + 8U = 2 \text{ hrs}_{\times 3}$

$20D + 12U = 2 \text{ hrs. } 50 \text{ min}_{\times 2}$

$45D + 24U = 6$ hrs

$\underline{\overset{-}{}40D \overset{-}{+} 24U = \overset{-}{}5 \text{ hrs } 40 \text{ min}}$

$5D = 20 \text{ min}\left(\frac{1}{3}\text{hr}\right)$

$D = \frac{1}{15} \Rightarrow x + y = 15$

$\therefore$ Downstream speed = 15 km/h

61. (a) Let speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$7.2D + 3.2U = 2 \text{ hrs}_{\times 3}$

$1.5D + 0.6U = 24 \text{ min}_{\times 16}$

$21.6D + 9.6U = 360$ min

$\underline{\overset{-}{}24D \overset{-}{+} 9.6U = \overset{-}{}384 \text{ min.}}$

$2.4D = 24 \text{ min}\left(\frac{2}{5}\text{hrs}\right)$

$D = \frac{1}{6} \Rightarrow x + y = 6$

$\therefore$ Downstream speed = 6 km/h

62. (c) Let, Speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$7.5D + 5U = 45 \text{ min}_{\times 2}$

$5D + 2.5U = 25 \text{ min}_{\times 3}$

$15D + 10U = 90$ min

$\underline{\overset{-}{}15D \overset{-}{+} 7.5U = \overset{-}{}75 \text{ min}}$

$2.5U = 15$ min

$U = \frac{1}{10} \Rightarrow x - y = 10$

Time taken to cover 6 km upstream

$= \frac{6}{10} \times 60 = 36$ min

63. (d) Let speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$7.5D + 5U = 45 \text{ min}_{\times 2}$

$5D + 2.5U = 25 \text{ min}_{\times 4}$

$15D + 10U = 90$ min

$\underline{\overset{-}{}20D \overset{-}{+} 10U = \overset{-}{}100 \text{ min}}$

$5D = 10 \text{ min}\left(\frac{1}{6}\text{hr}\right)$

$D = \frac{1}{30} \Rightarrow x + y = 30$

Time taken to go 6 km downstream

$= \frac{6}{30} \times 60 = 12$ min

64. (c) Let speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$5D + 3U = 55 \text{ min}_{\times 4}$

$9D + 4U = 1 \text{ hrs. } 25 \text{ min}_{\times 3}$

$20D + 12U = 220$ min

$\underline{\overset{-}{}27D \overset{-}{+} 12U = \overset{-}{}255 \text{ min}}$

$7D = 35 \text{ min}\left(\frac{7}{12}\text{hr}\right)$

$D = \frac{1}{12} \Rightarrow x + y = 12$

Time $= \frac{43.2}{12} = 3.6$ hrs

65. (a) Let speed of boat in still water $= x$ km/h

Speed of stream = y km/h

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

$33D + 27U = 6 \text{ hrs}_{\times 2}$

$22D + 36U = 6 \text{ hrs}_{\times 3}$

$66D + 54U = 12$ hrs

$\underline{\overset{-}{}66D \overset{-}{+} 108U = \overset{-}{}18 \text{ hrs}}$

$54U = 6$

$U = \frac{1}{9} \Rightarrow x - y = 9$

Now, $33D + 27 \times \frac{1}{9} = 6$

$\Rightarrow D = \frac{1}{11} \Rightarrow x + y = 11$

$\therefore$ Time $= \frac{36}{9} + \frac{44}{11} = 8$ hours

66. (b) Let, Speed of boat = x
Speed of stream = y

$U = \frac{1}{x-y}, D = \frac{1}{x+y}$

ATQ,

$$\begin{aligned}78D + 78U &= 32 \\ 52D + 15U &= 9 \\ 156D + 156U &= 64 \\ \underline{\overset{-}{156D} \overset{-}{+} 45U} &\underline{= \overset{-}{27}} \\ 111\,U &= 37\end{aligned}$$

$\Rightarrow U = \frac{1}{3} \Rightarrow x - y = 3$

Now,

$\Rightarrow 78D + 78 \times \frac{1}{3} = 32$

$\Rightarrow 78D = 6$

$\Rightarrow D = 13$

$\Rightarrow x + y = 13$

Then,

$x = \frac{13+3}{2} = 8$ km/hr.

$\therefore$ Distance covered by boat in 12 hours
$= 12 \times 8 = 96$ km

67. (d)

Down stream → $x + y = \frac{50}{2} = 25$ km/h ....(i)

Up stream → $x - y = \frac{28}{4} = 7$ km/h ......(ii)

$x = 16$ km/h

Now time $= \frac{44.8}{16} = 2.8$ hr

68. (b)

Down stream → $B + S = \frac{75}{3} = 25$ km/h ....(i)

Up stream → $B - S = \frac{55}{5} = 11$ km/h ......(ii)

$B = 18$ km/h

Time to cover 96 km in still water

$= \frac{96}{18} = 5\frac{1}{3}$ hr = 5 hr 20 min

69. (a)

Down stream → $B + W = \frac{1}{12} \times 60 = 5$ km/h ....(i)

Up stream → $B - W = \frac{3}{1} = 3$ km/h ......(ii)

$B = 4$ km/h

$\therefore$ Time taken to go 6 km in still water

$= \frac{6}{4} = 1.5$ hr = 1 hr 30 min

70. (c) 900 meter = 0.9 km

Let, the speed of man (boat) = x

Let, the speed of stream = y

$\frac{0.9}{x-y} = \frac{12}{60}h$

$\Rightarrow 2x - 2y = 9$

$\Rightarrow x - y = \frac{9}{2}$ ....(i)

$\frac{0.9}{x+y} = \frac{9}{60}$

$\Rightarrow x + y = 6$

From eqn. (i) & (ii)

$x = 5\frac{1}{4}$ km/hr.

71. (a) Let, Speed of current = x km/h
Then,
Speed of man = $x + 4$ km/h

$\frac{45}{x+(x+4)} + \frac{45}{(x+4)-x} = 10$

$\Rightarrow \frac{45}{2x+4} + \frac{35}{4} = 10$

$\Rightarrow x = 16$ km

Hence, Speed of man in still water
$= (x + 4)$
$= (16 + 4) = 20$ km/hr.

72. (a) Let, Distance AB = x
Downstream speed = (6 + 1.5)
= 7.5km/h
Upstream speed = (6 – 1.5) = 4.5 km/h
ATQ,

$\Rightarrow \frac{x}{7.5} + \frac{x}{4.5} = 2\frac{2}{3} = \frac{8}{3}$

$\Rightarrow \frac{x}{2.5} + \frac{x}{1.5} = 8$

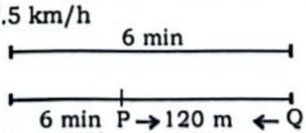
$\Rightarrow \frac{3x+5x}{7.5} = 8 \Rightarrow 8x = 8 \times 7.5$

$\Rightarrow x = 7.5$ km

Alternate Method:-

Speed of boat in still water (x) = 6 km/h
Speed of stream (y) = 1.5 km/h
Downstream speed (D) = (6 + 1.5)
= 7.5 km/h

73. (d)



$D_{down} - U_{up}$

$\Rightarrow (x + y) \times 360 - (x - y) \times 360 = 120$

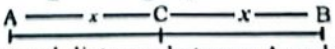
$\Rightarrow 3x + 3y - (3x - 3y) = 1$

$\Rightarrow 3x + 3y - 3x + 3y = 1$

$\Rightarrow 6y = 1$

$\Rightarrow y = \frac{1}{6} ms^{-1} = \frac{1}{6} \times \frac{18}{5} = 0.6$ km/h

74. (d)



Let total distance between A and B
= $2x$ km.

A.T.Q,

$\frac{2x}{10+5} + \frac{x}{10-5} = 20$ ....(i)

By solving equation (i)
$x = 60$ km.
So, distance between A and B
$= 2x = 120$ km.

75. (a) ATQ,

2Dx

$\Rightarrow \frac{T}{80T} = \frac{x^2 - y^2}{2D(2x)}$

161 $(2x)^2 - y^2$

$\Rightarrow \frac{161}{80} = \frac{1 \times (4x^2 - y^2)}{2 \times (x^2 - y^2)}$

$\Rightarrow 161x^2 - 161y^2 = (160x^2 - 40y^2)$

$\Rightarrow x^2 = 121y^2$

$\Rightarrow \frac{x^2}{y^2} = \frac{121}{1}$

$\Rightarrow \frac{x}{y} = \frac{11}{1}$

76. (c)

	Downstream	:	Upstream
Distance →	9	:	3
speed →	9	:	3

Let the speed of the boat in upstream and downstream be $3x$ and $9x$ respectively.

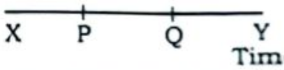
So the average speed in the whole journey

$= \frac{2 \times 9x \times 3x}{12x} = \frac{2 \times 300}{15} \Rightarrow x = \frac{80}{9}$

Speed of boat $= \frac{9x + 3x}{2} = 6x$

$= 6 \times \frac{80}{9} = 53.33$ km/h

77. (c)



Time
Travelling from X to Q → 4
Travelling from Y to Q → 5
Travelling from X to Q is double of the distance from Y to Q.

	Down Stream	:	Up Stream
Time →	$\frac{4}{2}$	:	5
Speed →	5	:	$\frac{4}{2}$
	5	:	2

Speed of boat : Speed of current

$\frac{5+2}{2} : \frac{5-2}{2}$

7 : 3

Speed of boat in downstream and Speed of Current = 10 : 3

18
Chapter

NUMBER SYSTEM

◆ TYPE – I ◆
CLASSIFICATION OF NUMBERS

1. If a,b,c,d and e are distinct prime numbers and the sum of these five numbers is odd, then a + b + c + d is:
DP CONSTABLE 23/11/2023 (Shift- 01)
(a) an even number
(b) an even prime number
(c) an odd number
(d) an odd prime number

2. Which type of numbers are NOT co-prime?
SSC GD 31/01/2023 (Shift-03)
(a) Any two prime numbers
(b) Any two consecutive odd numbers
(c) Any two consecutive numbers
(d) Any two consecutive even numbers

3. Let a and b be two numbers such that a and (b – a) are co-primes and b and (b + a) are co-primes, respectively. Which of the followings is true?
DP CONSTABLE 16/11/2023 (Shift- 03)
(a) b is prime
(b) a and b are co-prime
(c) a is not prime
(d) a and b are not co-prime

4. Which of the following pairs of numbers are relatively prime?
SSC GD 24/01/2023 (Shift-02)
(a) 24 & 38
(b) 24 & 92
(c) 39 & 68
(d) 24 & 68

5. Which of the following is a pair of co-primes?
DP CONSTABLE 14/11/2023 (Shift- 01)
(a) (198, 175)
(b) (7, 35)
(c) (217, 651)
(d) (32, 62)

6. Which of the following is a prime number?
SSC CPO 09/11/2022 (Shift-01)
(a) 54
(b) 39
(c) 68
(d) 89

7. Which of the following is a prime number?
DP Head Constable 13/10/2022 (Shift- 01)
(a) 701
(b) 679
(c) 657
(d) 697

8. If $(k^2 + 3)$ and $(k^3 + 5)$ are prime numbers then what will be the value of k?
DP CONSTABLE 14/11/2023 (Shift- 02)
(a) 2
(b) 4
(c) 7
(d) 3

9. What is the smallest prime number of 5 digits?
DP CONSTABLE 02/12/2023 (Shift- 01)
(a) 10001
(b) 10007
(c) 1003
(d) 10009

10. How many prime numbers are there between 20 and 50?
SSC CHSL 10/03/2023 (Shift-02)
(a) 8
(b) 5
(c) 6
(d) 7

11. How many prime numbers are there between 100 and 120 ?
SSC CHSL 14/03/2023 (Shift-02)
(a) 6
(b) 7
(c) 5
(d) 4

12. Three numbers which are co-prime to each other are such that the product of the first two is 391 and that of the last two is 943. Find the middle number.
DP CONSTABLE 16/11/2023 (Shift- 01)
(a) 19
(b) 41
(c) 17
(d) 23

13. The sum of three primes is 72. If one of the numbers is 24 more than the other number, then which one is the number?
DP CONSTABLE 17/11/2023 (Shift- 01)
(a) 31
(b) 37
(c) 29
(d) 47

14. Four prime numbers are arranged in ascending order. The product of the first three numbers is 255 and that of the last three is 1955. The largest prime number is:
SSC GD 10/01/2023 (Shift-04)
(a) 23
(b) 31
(c) 17
(d) 29

15. x, y and z are distinct prime numbers where $x < y < z$. If $x + y + z = 70$, then what is the value of z?
SSC CGL TIER-II 08/08/2022
(a) 31
(b) 29
(c) 43
(d) 37

16. Let, N be a four-digit positive integer such that the unit digit of N is prime and the product of all the digits of N is also prime. The number of possible values of N is:
DP CONSTABLE 28/11/2023 (Shift- 01)
(a) 12
(b) 3
(c) 4
(d) 8

17. Let ab, a ≠ b is 2-digit prime (number such that ba is also a prime number. The sum of all such number is:
SSC CGL TIER-II 16/11/2020
(a) 374
(b) 418
(c) 407
(d) 396

18. How many composite numbers are there between 23 and 43?
SSC CHSL 14/03/2023 (Shift-01)
(a) 7
(b) 14
(c) 15
(d) 18

19. How many composite numbers are there from 53 to 97?
SSC CGL TIER-II 08/08/2022
(a) 36
(b) 37
(c) 35
(d) 38

20. How many whole numbers are there between 11^2 and 12^2?
SSC CHSL TIER II 26/06/2023
(a) 23
(b) 21
(c) 22
(d) 24

21. If $\sqrt[3]{N}$ lies between 6 and 7, where N is an integer then how many values N can take?
SSC CGL TIER-II 08/08/2022
(a) 127
(b) 128
(c) 125
(d) 126

◆ TYPE – II ◆
UNIT DIGIT

22. Find the unit's digit in $(263)^{149} + (263)^{150} + (263)^{151}$.
SSC GD 25/11/2021 (Shift-02)
(a) 3
(b) 9
(c) 7
(d) 1

23. What is the unit digit in the expansion of 67^{32}?
UPSC CDS-I 2021
(a) 1
(b) 3
(c) 7
(d) 9

24. What is the digit in the unit place of 3^{99}?
UPSC CDS-II 2020
(a) 1
(b) 3
(c) 7
(d) 9

25. What is the unit place digit in the expansion of 7^{73}?
UPSC CDS-I 2019
(a) 1
(b) 3
(c) 7
(d) 9

26. What is the digit in the unit's place of the number represented by $3^{98} - 3^{89}$?
UPSC CDS-II 2019
(a) 3
(b) 6
(c) 7
(d) 9

27. If $x = (164)^{169} + (333)^{337} - (727)^{726}$ then what is the unit digit of x?
SSC CGL TIER-II 12/09/2019
(a) 5
(b) 7
(c) 8
(d) 9

28. If $x = (433)^{24} - (377)^{38} + (166)^{54}$ what is the unit digit of x?
SSC CGL TIER-II 22/01/2022
(a) 8
(b) 7
(c) 6
(d) 9

29. What is the last digit of the sum S = $9^{27} + 27^{9}$?

UPSC CDS-I 2023

(a) 3
(b) 6
(c) 7
(d) 9

30. What is the digit at the 100th place of number $(225)^{40}$?

UPSC CDS-I 2024

(a) 6
(b) 5
(c) 4
(d) 2

31. A prime number contains the digit x at unit's place. How many such digits of x are possible?

UPSC CDS-I 2019

(a) 3
(b) 4
(c) 5
(d) 6

32. All odd prime numbers upto 110 are multiplied together. What is the unit digit in this product?

UPSC CDS-I 2018

(a) 0
(b) 3
(c) 5
(d) N.O.T.

33. What are the last three digits in the multiplication of 4321012345 × 98766789?

UPSC CDS-II 01/09/2024

(a) 1, 0, 5
(b) 2, 0, 5
(c) 2, 1, 5
(d) 3, 0, 0

◆ TYPE – III ◆

FACTOR

34. Find the total number of factors of 3600.

SSC CGL TIER-II 12/09/2019

(a) 45
(b) 44
(c) 43
(d) 42

35. Consider the following statements in respect of all factors of 360:

1. The number of factors is 24.
2. The sum of all factors is 1170.

Which of the above statements is/are correct?

UPSC CDS-I 2023

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

36. Consider the number N = $12^6 \times 3^8 \times 5^3$. Which of the following statements is/are correct?

1. The number of odd factors of N is 60.
2. The number of even factors of N is 720.

Select the correct answer using the code given below:

UPSC CDS-II 2022

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

37. The sum of the odd divisors of 216 is:

SSC CPO 11/11/2022 (Shift-01)

(a) 16
(b) 14
(c) 40
(d) 600

38. Each prime number has _____ factor/factors.

DP Head Constable 20/10/2022 (Shift - 01)

(a) 1
(b) 4
(c) 2
(d) 0

39. What is the total number of factors of the number 720 except 1 and the number itself?

SSC CHSL 10/03/2023 (Shift-04)

(a) 29
(b) 27
(c) 32
(d) 28

40. The number of divisors of the number 38808, exclusive of the divisors 1 and itself, is

UPSC CDS-II 2018

(a) 74
(b) 72
(c) 70
(d) 68

41. What is the number of divisors of 1000 (excluding 1 and 1000)?

UPSC CDS-I 2022

(a) 12
(b) 13
(c) 14
(d) 16

42. What is the total number of factors of the number 840 except 1 and the number itself?

SSC CHSL 15/03/2023 (Shift-02)

(a) 29
(b) 30
(c) 28
(d) 31

43. What is distinct prime factor of the number 26381?

UPSC CDS-II 2021

(a) 29, 17, 37
(b) 31, 17, 47
(c) 19, 37, 13
(d) 23, 31, 37

44. Find the number of prime factors in the product $(30)^5 \times (24)^5$.

SSC CGL TIER-II 18/11/2020

(a) 45
(b) 10
(c) 35
(d) 30

45. A 4-digit number N has exactly 15 distinct divisors. What is the total number of distinct divisors of N^2?

UPSC CDS-II 01/09/2024

(a) 16
(b) 30
(c) 45
(d) 225

46. Which of the following numbers is greater than the sum of all the prime factors of 1560?

DP CONSTABLE 29/11/2023 (Shift- 03)

(a) 22
(b) 23
(c) 21
(d) 41

47. The number of factors of 196 which are divisible by 4 is:

SSC CPO 09/11/2022 (Shift-02)

(a) 228
(b) 4
(c) 57
(d) 3

48. What is the sum of the divisors of 484 that are perfect squares?

SSC CGL 20/07/2023 (Shift-01)

(a) 125
(b) 35
(c) 610
(d) 13

49. How many factors of 14,400 are divisible by 18 but not by 36?

SSC CHSL 05/07/2024 (Shift-04)

(a) 5
(b) 2
(c) 4
(d) 3

◆ TYPE – IV ◆

DIVISIBILITY

50. Which of the following numbers is divisible by both 2 and 5 ?

SSC CGL 11/09/2024 (Shift-02)

(a) 63840
(b) 20792
(c) 37915
(d) 37254

51. Which of the following numbers is divisible by 2, 5, 10 and 11?

SSC CGL 12/09/2024 (Shift-03)

(a) 203467
(b) 830942
(c) 589270
(d) 1234560

52. Which of the following numbers is NOT divisible by 8?

SSC CGL 19/09/2024 (Shift-03)

(a) 7344
(b) 5544
(c) 7497
(d) 4608

53. The number 4,29,714 is divisible by:

SSC CGL 23/09/2024 (Shift-03)

(a) 3 and 5
(b) 6 and 5
(c) 4 and 6
(d) 3 and 6

54. Which of the following numbers is divisible by 8?

SSC Phase-XII 26/06/2024 (Shift-03)

(a) 6816
(b) 5006
(c) 6124
(d) 6006

55. The number 5769116 is divisible by which of the following numbers?

SSC CGL TIER-II 02/03/2023

(a) 4
(b) 5
(c) 12
(d) 8

56. The number 2918245 is divisible by which of the following numbers?

SSC CGL TIER-II 03/03/2023

(a) 3
(b) 11
(c) 12
(d) 9

57. Which of the following numbers is divisible by 36?

SSC Phase-XII 21/06/2024 (Shift-02)

(a) 1542
(b) 8840
(c) 55512
(d) 96272

58. What is the condition for a number to be divisible by 3?

SSC CHSL TIER-II 26/06/2023

(a) The difference between the sum of the odd and even digits of that number is divisible by 3

(b) The last two digits of that number are divisible by 3

(c) The sum of the digits of that number is divisible by 3

(d) The last digit of that number is either 0 or any even number

59. If 436P5 is divisible by 3, then the largest value of P is:

SSC CGL 24/09/2024 (Shift-03)

(a) 12
(b) 6
(c) 8
(d) 9

60. Write the smallest digit in the blank space of a number 7__7624, so that the number formed is divisible by 3.

SSC CHSL 05/07/2024 (Shift-02)

(a) 1
(b) 2
(c) 0
(d) 3

61. Without actual division, find the remainder when 379843 is divided by 3.

SSC Phase-XII 26/06/2024 (Shift-02)

(a) 1
(b) 4
(c) 2
(d) 3

62. If the 3-digit number $2x3$ is divisible by 3, then the value of $x^2 + x$ is (consider the maximum value of x):

SSC CHSL 26/05/2022 (Shift-03)

(a) 7 (b) 20
(c) 56 (d) 2

63. Find the difference between squares of the greatest value and the smallest value of P if the number 5306P2 is divisible by 3.
SSC CGL 16/08/2021 (Shift-03)
(a) 60 (b) 68
(c) 36 (d) 6

64. Find the greatest value of 'k' in a 6-digit number 6745k2 such that the number is divisible by 3.
SSC CGL 24/09/2024 (Shift-01)
(a) 8 (b) 6
(c) 9 (d) 7

65. Without doing the actual division, find the remainder when 28735429 is divided by 9.
SSC CGL 09/09/2024 (Shift-02)
(a) 4 (b) 2
(c) 8 (d) 9

66. Find the least value of x for which 57x716 is divisible by 9.
SSC CGL 17/09/2024 (Shift-02)
(a) 1 (b) 9
(c) 0 (d) 8

67. If 6428A83 is divisible by 9, then the value of A is equal to :
SSC CHSL 09/07/2024 (Shift-01)
(a) 3 (b) 6
(c) 7 (d) 5

68. What will be the least value of x so that the 5-digit number 627x5 becomes divisible by 9?
SSC CHSL 01/07/2024 (Shift-01)
(a) 4 (b) 7
(c) 9 (d) 3

69. Which of the following numbers is divisible by 9?
SSC Phase-XII 20/06/2024 (Shift-03)
(a) 941201 (b) 132490
(c) 553986 (d) 350846

70. If 72*72 is divisible by 9 , the missing * digit will be :
SSC Phase-XII 24/06/2024 (Shift-03)
(a) 0 or 9 (b) 3 or 6
(c) 2 or 4 (d) 5 or 8

71. Find the smallest non-zero value of k so that 7-digit number 48397k5 is divisible by 9.
SSC Phase-XII 26/06/2024 (Shift-04)
(a) 4 (b) 5
(c) 9 (d) 2

72. How many of the following numbers are divisible by 3 but NOT by 9? 5826, 5964, 6039, 6336, 6489, 6564, 6867 and 6960
SSC CGL 27/07/2023 (Shift-03)
(a) 5 (b) 3
(c) 4 (d) 6

73. A 9-digit number 846523X7Y is divisible by 9, and Y – X = 6. Find the value of $\sqrt{2X+4Y}$.
SSC CGL 26/07/2023 (Shift-02)
(a) 4 (b) 2
(c) 6 (d) 8

74. What is the product of the largest and the smallest possible values of m for which a number 5m83m4m1 is divisible by 9?
SSC CHSL 12/04/2021 (Shift-01)
(a) 40 (b) 10
(c) 80 (d) 16

75. The number 611611611611 is:
SSC CHSL 11/07/2024 (Shift-04)
(a) Divisible by both 6 and 11
(b) Neither divisible by 6 nor by 11
(c) Divisible by 6 only
(d) Divisible by 11 only

76. Which of following number is NOT divisible by 11?
SSC CGL 12/09/2024 (Shift-02)
(a) 109153 (b) 5445
(c) 128041 (d) 80124

77. Which of the following numbers is divisible by 22?
SSC CHSL 04/07/2024 (Shift-01)
(a) 654320 (b) 602351
(c) 893002 (d) 645372

78. Which of the following numbers is divisible by 11?
SSC Phase-XII 24/06/2024 (Shift-02)
(a) 294621 (b) 956127
(c) 258913 (d) 958749

79. Which of the following numbers is NOT divisible by 11?
SSC CHSL 02/08/2023 (Shift-01)
(a) 1735624 (b) 752563
(c) 1661308 (d) 1904529

80. Which of the following numbers is divisible by 99?
SSC CGL 25/07/2023 (Shift-02)
(a) 31548 (b) 60687
(c) 44775 (d) 84456

81. Which of the following numbers is divisible by 11?
SSC CGL TIER-II 07/03/2023
(a) 5214341 (b) 5648741
(c) 6598321 (d) 2378965

82. Find the greatest value of b so that 30a68b (a > b) is divisible by 11.
SSC CGL 13/08/2021 (Shift-03)
(a) 4 (b) 9
(c) 3 (d) 6

83. If 5A72B is divisible by 11, then what is the value of B – A ?
SSC CHSL 09/03/2023 (Shift-03)
(a) 3 (b) 2
(c) 1 (d) 4

84. If 7845K854 is divisible by 11, then what is the value of K?
SSC CGL 09/09/2024 (Shift-03)
(a) 6 (b) 9
(c) 7 (d) 8

85. If P is a digit such that 6954P is divisible by 11, then P equals:
SSC CGL 17/09/2024 (Shift-03)
(a) 2 (b) 8
(c) 6 (d) 7

86. From the given numbers A, B, C and D, which number is NOT divisible by 11?
A = 712712 B = 177210
C = 64614 D = 756148
SSC CGL 19/09/2024 (Shift-02)
(a) C (b) D
(c) B (d) A

87. The least number which must be subtracted from 7278745 so as to obtain a sum that is divisible by 11 is:
SSC CGL 23/09/2024 (Shift-02)
(a) 3 (b) 1
(c) 5 (d) 2

88. If 3c2933k is divisible by both 5 and 11, where c and k are single digit natural numbers, then c + k = _____.
SSC CHSL 05/07/2024 (Shift-01)
(a) 7 (b) 8
(c) 6 (d) 5

89. A number is divisible by 11 if and only if the difference of the sum of the digits in the even and odd positions in the number is:
SSC CHSL 04/07/2024 (Shift-02)
(a) 0 or multiple of 11
(b) 0
(c) 11 (d) 1

90. If 1234567y is divisible by 11, then what is the value of y?
SSC CHSL 01/07/2024 (Shift-03)
(a) 3 (b) 4
(c) 1 (d) 2

91. If * is a digit such that 7235 * is divisible by 11, then the value of * is:
SSC Phase-XII 26/06/2024 (Shift-03)
(a) 6 (b) 8
(c) 9 (d) 5

92. Find the largest number which should replace P in the 7- digit number 87893P4 to make the number divisible by 4.
SSC Phase-XII 26/06/2024 (Shift-04)
(a) 2 (b) 8
(c) 9 (d) 0

93. Find the value of k such that the number k53206k is divisible by 4.
SSC CGL 19/04/2022 (Shift-03)
(a) 4 (b) 1
(c) 2 (d) 7

94. If the number 87m6203m is divisible by 6, then find the sum of all possible values of 'm'.
SSC CHSL 05/08/2021 (Shift-03)
(a) 20 (b) 15
(c) 16 (d) 10

95. Which of the following can be the value of 'k' so that the number 217924k is divisible by 6?
SSC CGL 09/09/2024 (Shift-01)
(a) 4 (b) 6
(c) 2 (d) 0

96. Replace * by the smallest digit so that 723*56* is divisible by 6.
SSC CGL 11/09/2024 (Shift-03)
(a) 4 (b) 3
(c) 2 (d) 1

97. If 321y72 is a multiple of 6, where y is a digit, what is the least value of y?
SSC CGL 13/09/2024 (Shift-01)
(a) 3 (b) 0
(c) 7 (d) 2

98. Find the least value of k for which a 7-digit number 249k876 is divisible by 6.
SSC CGL 17/09/2024 (Shift-01)
(a) 1 (b) 0
(c) 5 (d) 7

162. Find the sum of squares of the greatest value and the smallest value of K in the number so that the number 45082K is divisible by 3.

SSC CGL 17/08/2021 (Shift-03)

(a) 68 (b) 64
(c) 100 (d) 50

163. If the 8 digit number 888x53y4 is divisible by 72, then what is the value of $(7x + 2y)$, for the maximum value of y?

SSC CGL 18/08/2021 (Shift-01)

(a) 19 (b) 15
(c) 23 (d) 27

164. If a number P is divisible by 2 and another number Q is divisible by 3, then which of the following is true?

SSC CGL 18/08/2021 (Shift-03)

(a) P × Q is divisible by 6
(b) P + Q is divisible by 6
(c) P + Q is divisible by 5
(d) P × Q is divisible by 5

165. The number 823p2q is exactly divisible by 7, 11 and 13. What is the value of (p – q)?

SSC CGL 20/08/2021 (Shift-03)

(a) 8 (b) 3
(c) 5 (d) 11

166. If a nine-digit number 7698x138y is divisible by 72, then the value of $\sqrt{4x + y}$ is:

SSC CGL 24/08/2021 (Shift-03)

(a) 8 (b) 6
(c) 5 (d) 9

167. n = 475AB is a positive integer whose tens and units digits are A and B, respectively. If n is divisible by 5, 8 and 9, then what is (10A + B)?

SSC CHSL 16/04/2021 (Shift-01)

(a) 20 (b) 35
(c) 15 (d) 60

168. If the five-digit number 672xy is divisible by 3, 7 and 11, then what is the value of $(6x + 5y)$?

SSC CHSL 05/08/2021 (Shift-01)

(a) 17 (b) 24
(c) 23 (d) 16

169. If the five-digit number 457ab is divisible by 3, 7 and 11, then what is the value of $a^2 + b^2 - ab$?

SSC CHSL 12/08/2021 (Shift-01)

(a) 24 (b) 36
(c) 33 (d) 49

170. If the six digit number 15x1y2 is divisible by 44, then $(x + y)$ is equal to:

SSC CGL 10/06/2019 (Shift-02)

(a) 8 (b) 7
(c) 6 (d) 9

171. What is the value of x so that the seven digit number 8439x53 is divisible by 99?

SSC CGL 13/06/2019 (Shift-01)

(a) 9 (b) 4
(c) 3 (d) 6

172. What will be the smallest natural number to be filled in the blank for the number 23_45678' to be divisible by 22?

SSC CHSL 25/05/2022 (Shift-01)

(a) 7 (b) 1
(c) 9 (d) 3

173. Which of the following numbers is divisible by 6?

SSC CGL 25/09/2024 (Shift-03)

(a) 128530 (b) 12581
(c) 438750 (d) 62233

174. The number nearest to 7658 and exactly divisible by 45 is:

SSC CHSL 04/07/2024 (Shift-01)

(a) 7660 (b) 7645
(c) 7640 (d) 7650

175. The number 7918378 is divisible by:

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 9 (b) 4
(c) 13 (d) 11

176. The number 1254216 is divisible by which of the following numbers?

SSC Phase-XII 21/06/2024 (Shift-02)

(a) 16 (b) 8
(c) 11 (d) 5

177. The number 10000 is exactly divisible by which of the following number.

SSC Phase-XII 21/06/2024 (Shift-02)

(a) 18 (b) 17
(c) 14 (d) 25

178. The number 2918245 is divisible by which of the following numbers?

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 12 (b) 9
(c) 3 (d) 11

179. Which of the following is NOT divisible by 6.

(i) 1,97,232 (ii) 9,72,132
(iii) 8,00,552 (iv) 17,90,184

SSC CHSL 02/08/2023 (Shift-02)

(a) (i) (b) (iii)
(c) (iv) (d) (ii)

180. Which of the following is the nearest number to 13051 and is divisible by 9?

SSC CHSL 02/08/2023 (Shift-03)

(a) 13057 (b) 13056
(c) 13059 (d) 13058

181. What will be the greatest number 32a78b, which is divisible by 3 but NOT divisible by 9? (Where a and b are single digit number).

SSC CHSL 09/08/2023 (Shift-02)

(a) 324781 (b) 329787
(c) 326787 (d) 329784

182. The number 76050 is NOT divisible by which of the following numbers?

SSC CHSL 14/08/2023 (Shift-02)

(a) 4 (b) 9
(c) 3 (d) 13

183. Which of the numbers amongst 25560, 35751, 481168, and 49608 is NOT divisible by 24?

SSC CHSL 14/08/2023 (Shift-03)

(a) 35751 (b) 48168
(c) 25560 (d) 49608

184. How many of the following numbers are divisible by 132?
660, 754, 924, 1452, 1526, 1980, 2045 and 2170

SSC CGL 17/07/2023 (Shift-03)

(a) 3 (b) 6
(c) 5 (d) 4

185. Which of the following numbers is divisible by 24?

SSC CGL 18/07/2023 (Shift-01)

(a) 52668 (b) 49512
(c) 64760 (d) 26968

186. Which number among 24963, 24973, 24983 & 24993 is divisible by 7?

SSC CGL 18/07/2023 (Shift-02)

(a) 24973 (b) 24983
(c) 24963 (d) 24993

187. Which of the following numbers is divisible by 36?

SSC CGL 19/07/2023 (Shift-01)

(a) 8840 (b) 1542
(c) 96272 (d) 55512

188. Which number among 34936, 35508, 35580 and 36508 is divisible by 33?

SSC CGL 20/07/2023 (Shift-04)

(a) 35508 (b) 35580
(c) 36508 (d) 34936

189. The sum of two numbers 10373 & 24871 is divisible by which of the following numbers?

Matriculation Level 27/06/2023 (Shift-01)

(a) 7 (b) 8
(c) 6 (d) 13

190. The number 974581297426 is divisible by which of the following?

Matriculation Level 28/06/2023 (Shift-04)

(a) 6 (b) 11
(c) 4 (d) 9

191. What is the sum of all three digit numbers which are divisible by 15?

SSC CHSL 13/03/2023 (Shift-02)

(a) 41200 (b) 36825
(c) 32850 (d) 28750

192. The number 1254216 is divisible by which of the following numbers?

SSC CGL TIER-II 06/03/2023

(a) 16 (b) 5
(c) 8 (d) 11

193. When $f(m) = m^5 + 5m^4 - 3m + 7$ is divided by (m – 2), then the remainder is ______.

SSC CGL 17/09/2024 (Shift-03)

(a) 7 (b) 5
(c) 0 (d) 113

194. For what least value of n, $2^{2n} + 2n$ is completely divided by 6, where n is an integer?

SSC CGL 23/09/2024 (Shift-01)

(a) 3 (b) 1
(c) 0 (d) 2

195. If m is even, then $(8^m - 1)$ is divisible by:

SSC CGL 25/09/2024 (Shift-02)

(a) 63 (b) 42
(c) 65 (d) 8

196. K being any odd number greater than 1, $k^{33} - k$ is always divisible by:

SSC CHSL 05/07/2024 (Shift-04)

(a) 24 (b) 13
(c) 5 (d) 15

197. When m is divided by 7, the remainder is 5. When 3m is divided by 7, the remainder is:

SSC CGL 19/07/2023 (Shift-04)

(a) 3 (b) 2
(c) 1 (d) 0

198. $7^{15} + 7^{16} + 7^{17}$ is divisible by which of the following given numbers?

SSC CGL 26/09/2024 (Shift-03)

(a) 3 (b) 5
(c) 2 (d) 4

199. $6^{25} + 6^{26} + 6^{27} + 6^{28}$ is divisible by:

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 255 (b) 254
(c) 259 (d) 256

200. Which of the following numbers will completely divide $4^{12} + 4^{13} + 4^{14} + 4^{15}$?

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 3 (b) 17
(c) 11 (d) 7

201. Which of the following numbers will completely divide $4^{12} + 4^{13} + 4^{14} + 4^{15}$?

SSC CGL 18/07/2023 (Shift-01)

(a) 3 (b) 7
(c) 11 (d) 17

202. Which of the following numbers will exactly divide $(6^{61} + 6^{62} + 6^{63} + 6^{64})$?

Higher Secondary 30/06/2023 (Shift-02)

(a) 10 (b) 13
(c) 7 (d) 11

203. $3^{50} + 9^{26} + 9^{27} + 9^{28} + 9^{29}$ is divisible by which of the following integers?

SSC CGL 06/12/2022 (Shift-02)

(a) 11 (b) 5
(c) 7 (d) 2

204. $5^{71} + 5^{72} + 5^{73} + 5^{74} + 5^{75}$ is divisible by which of the following number?

SSC CGL TIER-II 03/02/2022

(a) 71 (b) 69
(c) 89 (d) 73

205. What number should be subtracted from $x^3 - 4x^2 - 8x + 11$ to make the number divisible by $(x + 2)$?

SSC CGL 19/09/2024 (Shift-01)

(a) 9 (b) 5
(c) 3 (d) 7

206. Identify a single-digit number other then 1, which may exactly divide the number $17^3 + 18^3 - 16^3 - 15^3$.

SSC CHSL 08/07/2024 (Shift-02)

(a) 2 (b) 3
(c) 5 (d) 7

207. Which of the following numbers are divisible by 2, 3 and 5?

SSC CGL 02/12/2022 (Shift-04)

(a) 5467760 (b) 1345678
(c) 2345760 (d) 2456732

208. How many of the following numbers are divisible by 156?
312, 620, 936, 1402, 1872, 3216, 7176, 8108

SSC CPO 09/11/2022 (Shift-02)

(a) 5 (b) 3
(c) 4 (d) 2

209. A 6-digit number has digits as consecutive natural numbers. The number is always divisible by____.

SSC CGL 27/07/2023 (Shift-02)

(a) 4 (b) 5
(c) 2 (d) 3

210. A six-digit number is divisible by 198. If the digits are rearranged, even then the number will be divisible by:

SSC CPO 11/11/2022 (Shift-02)

(a) 3 (b) 6
(c) 2 (d) 66

211. What is the largest 6-digit number divisible by 52?

SSC CHSL 27/05/2022 (Shift-02)

(a) 999984 (b) 999999
(c) 999960 (d) 100000

212. Any six-digit number that is formed by repeating a three-digit number, is always divisible by:

SSC CGL 12/12/2022 (Shift-02)

(a) 111 (b) 1001
(c) 19 (d) 101

213. Numbers divisible by 9 between 43 and 481 are:

SSC CGL 06/12/2022 (Shift-03)

(a) 51 (b) 49
(c) 48 (d) 50

214. How many numbers between 400 and 700 are divisible by 5, 6 and 7?

SSC CPO 24/11/2020 (Shift-02)

(a) 20 (b) 10
(c) 2 (d) 5

215. How many numbers between 10 and 65 are divisible by 2, 3 and 4?

SSC CHSL 08/07/2024 (Shift-01)

(a) 3 (b) 5
(c) 7 (d) 9

216. How many numbers lie between 2000 & 2020 that are divisible by 8?

SSC CHSL 02/07/2024 (Shift-01)

(a) 4 (b) 3
(c) 5 (d) 2

217. A four-digits number abba is divisible by 4 and a < b. How many such numbers are there ?

SSC CGL 26/07/2023 (Shift-01)

(a) 10 (b) 8
(c) 12 (d) 6

218. How many numbers are there between 501 and 701 which are divisible by 10 but are not divisible by 3?

SSC CHSL 16/03/2023 (Shift-01)

(a) 20 (b) 14
(c) 15 (d) 13

219. How many numbers are there between 201 and 401 which are divisible by 5 but not by 4?

SSC CHSL 16/03/2023 (Shift-04)

(a) 30 (b) 20
(c) 40 (d) 45

220. How many two-digit numbers are divisible by 3 or 5?

SSC CHSL 26/05/2022 (Shift-01)

(a) 48 (b) 41
(c) 42 (d) 40

221. How many numbers are there from 500 to 650 (including both) which are neither divisible by 3 nor by 7?

SSC CGL 11/04/2022 (Shift-02)

(a) 21 (b) 121
(c) 87 (d) 99

222. How many numbers are there from 200 to 800 which are neither divisible by 5 nor by 7?

SSC CGL 04/03/2020 (Shift-01)

(a) 407 (b) 410
(c) 413 (d) 411

223. How many number between 300 and 700 are divisible by 5, 6 and 8?

SSC CPO 25/11/2020 (Shift-02)

(a) 5 (b) 20
(c) 3 (d) 2

224. Which composite number can divide the sum of the first 12 natural numbers?

SSC CGL 24/09/2024 (Shift-03)

(a) 6 (b) 12
(c) 4 (d) 8

225. What is the sum of all three digits numbers which are divisible by 20?

SSC CHSL 20/03/2023 (Shift-01)

(a) 21400 (b) 24300
(c) 25800 (d) 22500

226. What is the sum of all three digit numbers which are divisible by 20?

SSC CHSL 21/03/2023 (Shift-02)

(a) 19400 (b) 20500
(c) 24300 (d) 21800

227. What is the sum of all two digit numbers which are divisible by 9?

SSC CHSL 21/03/2023 (Shift-04)

(a) 565 (b) 535
(c) 585 (d) 475

228. The sum of 3-digit numbers abc, cab and bca is not divisible by:

SSC CGL 24/08/2021 (Shift-01)

(a) a + b + c (b) 37
(c) 31 (d) 3

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229. On dividing a number by 55, we get 28 as the remainder. On dividing the same number by 11, what is the remainder?

SSC CGL 24/09/2024 (Shift-02)

(a) 5 (b) 8
(c) 7 (d) 6

230. On dividing a certain number by 363, we get 17 as the remainder. What will be the remainder when the same number is divided by 11?

SSC CGL 05/12/2022 (Shift-02)

(a) 7 (b) 8
(c) 6 (d) 9

231. On dividing a certain number by 304, we get 43 as the remainder. If the same number is divided by 16, what will be the remainder?

SSC CHSL 02/07/2024 (Shift-02)

(a) 11 (b) 8
(c) 12 (d) 15

232. On dividing a certain number by 459, we get 19 as remainder. What will be the remainder, when the same number is divided by 17?

SSC CHSL 11/07/2024 (Shift-02)

(a) 13 (b) 11
(c) 2 (d) 1

233. When a number is divided by 512 it leaves a remainder 67. If the same number is divided by 32, then what will be the remainder?

SSC CHSL 03/07/2024 (Shift-01)

(a) 0 (b) 5
(c) 4 (d) 3

234. When the integer n is divided by 5, the remainder is 3. What is the remainder if 6n is divided by 5?

SSC CHSL 08/07/2024 (Shift-02)

(a) 3 (b) 0
(c) 1 (d) 2

235. A number when divided by 78 gives the quotient 280 and the remainder 0. If the same number is divided by 65, what will be the value of the remainder?

SSC CHSL 02/08/2023 (Shift-04)

(a) 1 (b) 3
(c) 0 (d) 2

236. When a number is divided by 45, the remainder is 21. What will be the remainder when the number is divided by 15?

SSC CGL 26/07/2023 (Shift-03)

(a) 6 (b) 5
(c) 3 (d) 0

237. A number when divided by 7 leaves remainder 4. If the square of the same number is divided by 7, then what is the remainder?

SSC CGL 03/12/2022 (Shift-03)

(a) 3 (b) 1
(c) 4 (d) 2

238. In a division sum, the divisor is 10 times the quotient and four times the remainder. What is the dividend if the remainder is 45?

SSC CGL 08/12/2022 (Shift-02)

(a) 4123 (b) 3285
(c) 2895 (d) 5412

239. If a positive integer N is divided by 7, the remainder is 3. Which of the following numbers yields a remainder of 0 when it is divided by 7?

SSC CHSL 27/05/2022 (Shift-03)

(a) N + 5 (b) N + 2
(c) N + 4 (d) N + 3

240. When a number is divided by 7, the remainder is 1. What will be the remainder when the cube of this number is divided by 7?

SSC CHSL 04/08/2023 (Shift-03)

(a) 2 (b) 4
(c) 1 (d) 3

241. The divisor is 10 times the quotient and 5 times the remainder in a division sum. What is the dividend if the remainder is 46?

SSC CHSL 03/08/2023 (Shift-02)

(a) 5972 (b) 4286
(c) 4874 (d) 5336

242. In a division problem, the divisor is 4 times the quotient and 2 times the remainder. If the remainder is 32, then find the dividend.

SSC CGL 11/09/2024 (Shift-01)

(a) 1056 (b) 1650
(c) 3240 (d) 1065

243. In a division sum, the divisor is 13 times the quotient and 6 times the remainder. If the remainder is 39, then the dividend is:

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 4,240 (b) 4,800
(c) 4,251 (d) 4,576

244. In a division sum, the divisor is 10 times the quotient and 5 times the remainder. If the remainder is 12, then what is the dividend?

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 352 (b) 386
(c) 368 (d) 372

245. In a division sum, the divisor is 11 times the quotient and 5 times the remainder. If the remainder is 44, then the dividend is:

SSC CHSL 07/08/2023 (Shift-04)

(a) 8888 (b) 4448
(c) 8444 (d) 4444

246. On dividing 8675123 by a certain number, the quotient is 33611 and the remainder is 3485. The divisor is

SSC CHSL 25/05/2022 (Shift-02)

(a) 538 (b) 258
(c) 248 (d) 356

247. When 200 is divided by a positive integer x, the remainder is 8. How many values of x are there?

SSC CGL 03/03/2020 (Shift-01)

(a) 6 (b) 7
(c) 8 (d) 5

248. When 732 is divided by a positive integer x, the remainder is 12. How many values of x are there?

SSC CGL 04/03/2020 (Shift-01)

(a) 19 (b) 20
(c) 18 (d) 16

249. When the integer n is divided by 18, the quotient is x and the remainder is 6, When the integer is divided by 25, the quotient is y and the remainder is 15. Which of the following is true?

SSC CHSL 03/07/2024 (Shift-05)

(a) $25y + 18x = 9$ (b) $25y - 18x = 9$
(c) $18x + 25y = 9$ (d) $18x - 25y = 9$

250. The difference of two numbers is 1564. After dividing the larger number by the smaller, we get 6 as quotient and 19 as remainder. What is the smaller number?

SSC CGL 02/12/2022 (Shift-03)

(a) 456 (b) 287
(c) 623 (d) 309

251. Mohan divides 18935 by a certain number. If his quotient and remainder are 102 and 65 respectively, then the divisor is.

Higher Secondary 28/06/2023 (Shift-02)

(a) 186 (b) 183
(c) 184 (d) 185

252. A natural number n divides 732 and leaves 12 as a remainder. How many values of n are possible?

SSC CHSL 09/07/2024 (Shift-01)

(a) 18 (b) 20
(c) 16 (d) 22

253. Two numbers, when divided by a certain divisor, leave the remainder 57. When sum of the two numbers is divided by the same divisor, the remainder is 49. The divisor is:

SSC CHSL 08/08/2023 (Shift-03)

(a) 56 (b) 57
(c) 49 (d) 65

254. Two positive numbers differ by 1280. When the greater number is divided by the smaller number, the quotient is 7 and the remainder is 50. The greater number is:

SSC CGL TIER-II 15/11/2020

(a) 1458 (b) 1485
(c) 1585 (d) 1558

255. Find the remainder when 179 × 172 × 173 is divided by 17?

SSC CHSL 03/07/2024 (Shift-02)

(a) 16 (b) 3
(c) 10 (d) 11

256. What is the remainder when the product of 335, 608 and 853 is divided by 13?

SSC CGL 12/04/2022 (Shift-01)

(a) 11 (b) 12
(c) 6 (d) 7

257. The remainder when 72 × 73 × 78 × 76 is divided by 35 is:

SSC CPO 24/11/2020 (Shift-01)

(a) 12 (b) 8
(c) 22 (d) 15

258. If 1433 × 1433 × 1422 × 1425 is divided by 12, then what is the remainder?

SSC CPO 23/11/2020 (Shift-01)

(a) 3 (b) 9
(c) 8 (d) 6

259. When 75 × 73 × 78 × 76 is divided by 34. Find the remainder.

SSC CPO 23/11/2020 (Shift-03)

(a) 18 (b) 12
(c) 22 (d) 15

260. If 1433 ×1433 × 1422 × 1425 is divided by 10, then what is the remainder?

SSC CPO 25/11/2020 (Shift-01)

(a) 9 (b) 0
(c) 3 (d) 8

261. If $(77^{77} + 77)$ is divided by 78, then the remainder will be:

SSC CGL 10/09/2024 (Shift-02)

(a) 76 (b) 77
(c) 78 (d) 1

262. Find the remainder: $(17^{13} - 21) \div 18$

SSC CGL 13/09/2024 (Shift-03)

(a) 15 (b) 17
(c) 14 (d) 21

263. When $(8^6 + 1)$ is divided by 7, remainder would be?

SSC CHSL 10/07/2024 (Shift-01)

(a) 6 (b) 2
(c) 1 (d) 4

264. What will be the remainder when $27^{27} + 27$ is divided by 28?

SSC CGL 01/12/2022 (Shift-03)

(a) 28 (b) 27
(c) 25 (d) 26

265. Find the remainder when $9^{20} + 2$ is divided by 4.

SSC CGL 26/09/2024 (Shift-01)

(a) 1 (b) 3

(c) 0 (d) 2

266. What will be the remainder when $(265)^{4081} + 9$ is divided by 266?

SSC CGL 14/07/2023 (Shift-01)

(a) 8 (b) 6

(c) 1 (d) 9

267. Find the remainder, if 19^{200} is divided by 20 ?

SSC CGL 18/09/2024 (Shift-02)

(a) 2 (b) –1

(c) 1 (d) 3

268. When 2^{256} is divided by 17, the remainder would be:

SSC CHSL 10/07/2024 (Shift-04)

(a) 2 (b) 5

(c) 0 (d) 1

269. What will be the remainder when 4^{999} is divided by 7?

Matriculation Level 28/06/2023 (Shift-02)

(a) 2 (b) 4

(c) 1 (d) 3

270. What will be the remainder when 7^{42} is divided by 48?

SSC CGL 03/12/2022 (Shift-02)

(a) 2 (b) 3

(c) 1 (d) 0

271. The remainder when $19^{19}+20$ is divided by 18 is:

SSC CGL 09/12/2022 (Shift-04)

(a) 3 (b) 2

(c) 1 (d) 0

272. When $(2^{24} - 1)$ is divided by 7, the remainder is:

SSC CHSL 04/08/2021 (Shift-03)

(a) 4 (b) 2

(c) 0 (d) 1

273. What is the remainder when we divide $5^{70} + 7^{70}$ by 74?

SSC CGL 07/03/2020 (Shift-01)

(a) 5 (b) 0

(c) 7 (d) 1

274. The remainder of the term $9 + 9^2 + \ldots + 9^{(2n + 1)}$ when divided by 6 is:

SSC CHSL 11/08/2023 (Shift-04)

(a) 1 (b) 4

(c) 2 (d) 3

275. What is the remainder when $(x^{17} + 1)$ is divided by $(x + 1)$?

SSC CGL 25/07/2023 (Shift-03)

(a) x (b) $x-1$

(c) 0 (d) 1

276. If each of the two numbers 5^{16} and 5^{25} are divided by 6, the remainders are R_1 and R_2, respectively. What is the value of $\frac{R_1+R_2}{R_2}$?

SSC CGL 19/04/2022 (Shift-01)

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$

(c) $\frac{1}{5}$ (d) $\frac{6}{5}$

277. When positive numbers x, y and z are divided by 31, the remainders are 17, 24 and 27, respectively. When $(4x - 2y + 3z)$ is divided by 31, the remainder will be:

SSC CGL TIER-II 15/11/2020

(a) 9 (b) 8

(c) 16 (d) 19

278. What are the last three digit of the multiplication 654321 × 123456 ?

SSC CHSL 14/03/2023 (Shift-04)

(a) 376 (b) 344

(c) 324 (d) 352

279. If the polynomial $(2x^3 + ax^2 + 3x - 5)$ and $(x^3 + x^2 - 2x + a)$ leave the same remainder when divided by $(x - 2)$, find the remainder.

SSC CPO 28/06/2024 (Shift-03)

(a) 4 (b) 3

(c) 2 (d) 5

280. What must be added to $(x^3 - 3x^2 + 4x - 75)$ to obtain a polynomial that is exactly divisible by $(x - 5)$?

SSC CPO 29/06/2024 (Shift-01)

(a) 5 (b) 6

(c) 4 (d) 2

281. A number N when divided by 6 leaves a remainder 3. What will be the remainder when $(N^2 + 5N + 8)$ is divided by 6?

SSC CGL 06/12/2022 (Shift-01)

(a) 1 (b) 3

(c) 5 (d) 2

282. When $m^{12} - 1$ is divided by m + 1, the remainder is:

SSC CGL 13/12/2022 (Shift-01)

(a) 1 (b) 2

(c) 0 (d) –1

283. When $f(x) = 15x^3 - 14x^2 - 4x + 10$ is divided by $(3x + 2)$, then the remainder is:

SSC CHSL 27/05/2022 (Shift-02)

(a) – 1 (b) 1

(c) – 2 (d) 2

284. A number 'n' when divided by 6 leaves remainder 2. What will be the remainder when $(n^2 + n + 2)$ is divided by 6?

SSC CGL 18/04/2022 (Shift-03)

(a) 6 (b) 2

(c) 4 (d) 0

285. When number n is divided by 6, the reminder is 3. What will be the remainder when $(n^4+n^3+n^2+5n)$ is divided by 6?

Graduation level 15/03/2022 (Shift-01)

(a) 2 (b) 1

(c) 0 (d) 3

286. Find the remainder, when we divide $2x^3 - 3x^2 + 6x - 4$ by $2x - 3$?

SSC CHSL 04/07/2024 (Shift-03)

(a) 5 (b) 6

(c) –5 (d) –6

287. What is the remainder when 3^8 is divided by 7?

SSC CHSL 08/08/2023 (Shift-02)

(a) 5 (b) 4

(c) 6 (d) 2

288. Find the remainder when $8^8 + 6$ is divided by 7.

SSC CGL 25/07/2023 (Shift-01)

(a) 0 (b) 2

(c) 3 (d) 1

289. When a number is successively divided by 3, 4 and 7, the remainder obtained are 2, 3 and 5 respectively. What will be the remainder when 84 divides the same number?

SSC CPO 24/11/2020 (Shift-03)

(a) 71 (b) 53

(c) 30 (d) 48

290. After the division of a number successively by 2, 3 and 5, the remainders are 1, 2 and 3, respectively. What will be the remainder, if 13 divides the same number (if the last quotient is 1)?

SSC CHSL 05/07/2024 (Shift-03)

(a) 1 (b) 2

(c) 0 (d) 3

291. Find the number when successively divided by 3, 5 and 7 leaves remainder 2, 1 and 3 respectively, and the last quotient is 3.

SSC CHSL 01/07/2024 (Shift-02)

(a) 360 (b) 362

(c) 365 (d) 367

292. When a number is successively divided by 3, 4 and 7, the remainders obtained are 2, 3 and 5, respectively. What will be the remainder when 84 divided the same number?

SSC CPO 24/11/2020 (Shift-02)

(a) 71 (b) 30

(c) 48 (d) 53

293. When a number is successively divided by 3, 4 and 7, the remainder obtained is 2, 3 and 5 respectively. What will be the remainder when 42 divides the same number?

SSC CPO 25/11/2020 (Shift-02)

(a) 41 (b) 31

(c) 30 (d) 29

294. When a number is divided by 3, the remainder is 2. Again, when the quotient is divided by 7, the remainder is 5. What will be the remainder when the original number is divided by 21?

SSC CHSL 11/08/2021 (Shift-01)

(a) 13 (b) 16

(c) 14 (d) 17

295. Successive division of a number by 2, 3, 5 and 7 gives remainders 1,4,0 and 5, respectively. What will be the sum of the remainders if the same number is divided by 7, 5, 3 and 2 successively?

SSC CHSL 01/07/2024 (Shift-04)

(a) 8 (b) 9

(c) 10 (d) 17

296. If two numbers are each divided by the same divisor, then the remainder are 6 and 7, respectively. If the sum of the two numbers be divided by the same divisor, the remainder is 5. The divisor is:

SSC CHSL 04/07/2024 (Shift-02)

(a) 6 (b) 8
(c) 13 (d) 4

297. Which of the following is the largest 5-digit number divisible by 47?

SSC CGL 10/09/2024 (Shift-01)

(a) 99999 (b) 98888
(c) 99969 (d) 10000

298. Find the smallest number to be added to 999, so that 99 divides the sum exactly.

SSC CGL 11/09/2024 (Shift-01)

(a) 99 (b) 0
(c) 90 (d) 9

299. What is the smallest number that must be added to 19487161 so that it is divisible by 11?

SSC CHSL 04/07/2024 (Shift-04)

(a) 16 (b) 5
(c) 10 (d) 11

300. What least number must be subtracted from 2001 to get a number exactly divisible by 17?

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 14 (b) 12
(c) 13 (d) 11

301. A six-digit number is divisible by 33. If 21 is added to the number, then the new number which formed is also divisible by:

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 2 (b) 3
(c) 4 (d) 5

302. What is the least number that must be added to the greatest 6-digit number so that sum will be exactly divisible by 294?

SSC CHSL 07/08/2023 (Shift-02)

(a) 234 (b) 194
(c) 269 (d) 189

303. Find the smallest number to be added to 1000 so that 55 divides the sum exactly.

SSC CHSL 10/08/2023 (Shift-03)

(a) 25 (b) 45
(c) 35 (d) 10

304. Find the smallest number that can be subtracted from 148109326 so that it becomes divisible by 8.

SSC CGL 17/07/2023 (Shift-01)

(a) 4 (b) 8
(c) 6 (d) 10

305. The largest 5-digit number exactly divisible by 88 is:

SSC CGL 17/07/2023 (Shift-02)

(a) 99990 (b) 99968
(c) 99978 (d) 99984

306. A six-digit number is divisible by 33. If 54 is added to the number, then the new number formed will also be divisible by:

SSC CGL 17/07/2023 (Shift-04)

(a) 3 (b) 2
(c) 5 (d) 7

307. The smallest number added to 888 so that it is exactly divisible by 35 is:

SSC CGL 18/07/2023 (Shift-03)

(a) 22 (b) 23
(c) 20 (d) 21

308. Which of the following is the smallest 5-digit number that is exactly divisible by 526 ?

SSC CGL 27/07/2023 (Shift-01)

(a) 10520 (b) 11046
(c) 10516 (d) 10426

309. What is the greatest four-digit number which when divided by 3 & 4 leaves remainder 2 in each case?

SSC MTS 09/05/2023 (Shift-01)

(a) 9994 (b) 9996
(c) 9998 (d) 9995

310. The nearest number which is greater to 87501, and is completely divisible by 765 is :

SSC CGL 03/12/2022 (Shift-01)

(a) 88975 (b) 87975
(c) 87966 (d) 87775

311. What is the smallest number that should be added to 4567 so that the sum is divisible by 7?

SSC CGL 05/12/2022 (Shift-03)

(a) 7 (b) 5
(c) 6 (d) 4

312. 9435 is added to 7593, then 2607 is subtracted from the sum. The result is divisible by:

SSC CGL 07/12/2022 (Shift-03)

(a) 4 (b) 10
(c) 3 (d) 5

313. A six-digit number 763254 is divisible by 18. If we subtract five times of 41 from the number, the new number which is formed will be divisible by:

SSC CPO 11/11/2022 (Shift-02)

(a) 2 (b) 7
(c) 5 (d) 3

314. What is the sum of the digits of the largest five-digit number which is divisible by 5, 35, 39 and 65?

SSC CGL 20/08/2021 (Shift-02)

(a) 33 (b) 30
(c) 35 (d) 27

315. Let, x be the least number which when subtracted from 10424 gives a perfect square number. What is the least number by which x should be multiplied to get a perfect square?

SSC CGL TIER-II 16/11/2020

(a) 3 (b) 6
(c) 5 (d) 2

316. Find the remainder when we divide $3x^4 - 2x^2 + 4x - 1$ by $2x - 1$.

SSC CGL 07/12/2022 (Shift-04)

(a) 4 (b) 3
(c) $\frac{11}{16}$ (d) $\frac{15}{16}$

• TYPE – VI •
MISCELLANEOUS QUESTIONS

317. A two-digit number is 12 more than five times the sum of its digits. The number formed by reversing the digits is 9 less than the original number. The number is:

SSC CHSL 08/07/2024 (Shift-02)

(a) 78 (b) 87
(c) 69 (d) 96

318. The sum of the digits of a two-digit number is 9. If the digits are reversed, then the number is increased by 27. Find the number

SSC CHSL 10/07/2024 (Shift-01)

(a) 54 (b) 63
(c) 45 (d) 36

319. The sum of the digits of a two-digit number is 9. The number obtained by interchanging its digits exceeds the given number by 45, then the original number is:

SSC CHSL 11/07/2024 (Shift-03)

(a) 18 (b) 27
(c) 36 (d) 54

320. The sum of two-digit number and the number obtained by interchanging the digit is 77. If the difference of digits is 1, then the number is:

SSC CHSL 05/07/2024 (Shift-02)

(a) 67 (b) 45
(c) 43 (d) 12

321. If the digits of a two digit number is reversed, then the number is decreased by 36. Which of the following is correct regarding the number?

I. The difference of the digits is 4.
II. The value of number can be 84
III. Number is always a composite number.

SSC CGL TIER-II 08/08/2022

(a) I and II (b) I and III
(c) II and III (d) I, II and III

322. A number whose fifth part increased by 5 is equal to its third part decreased by 7. Find half of the number.

SSC CGL 26/09/2024 (Shift-01)

(a) 45 (b) 150
(c) 80 (d) 60

323. The sum of five consecutive numbers is 80. Find the largest number?

SSC CGL 18/09/2024 (Shift-01)

(a) 18 (b) 15
(c) 19 (d) 14

324. The sum of two consecutive even numbers is 174. Find the smaller number.

SSC CGL 26/09/2024 (Shift-02)

(a) 84 (b) 90
(c) 86 (d) 88

325. The sum of the five consecutive even numbers is 2720. The sum of the third and fifth numbers is:

SSC CHSL 02/07/2024 (Shift-02)

(a) 1192 (b) 1294
(c) 1092 (d) 1392

326. If the sum of three consecutive composite numbers is 36, then what is the product of the three numbers?

SSC CHSL 14/03/2023 (Shift-03)

(a) 1460 (b) 1750
(c) 1680 (d) 1820

327. If the sum of two numbers is 25 and their product is 144, then what is the position difference between the two numbers?

SSC CHSL 25/05/2022 (Shift-01)

(a) 8 (b) 7
(c) 16 (d) 9

328. What is the sum of all two digit even numbers?

SSC CHSL 15/03/2023 (Shift-01)

(a) 2520 (b) 2470
(c) 2430 (d) 2410

329. What is the sum of all two digit odd numbers?

SSC CHSL 17/03/2023 (Shift-02)

(a) 2375 (b) 2475
(c) 2325 (d) 2425

330. What is the number of digits required for numbering a book with 428 pages?

SSC CHSL 02/07/2024 (Shift-04)

(a) 1176 (b) 1500
(c) 2000 (d) 988

331. Divide 25 into two parts such that 6 times of the larger part added to 4 times of the smaller part is equal to 130. Find the larger part?

SSC CHSL 11/07/2024 (Shift-03)

(a) 13 (b) 15
(c) 14 (d) 20

332. The sum of two numbers is 76. Three times the larger number is 46 more than four times the smaller one. Find the two numbers?

SSC CHSL 11/07/2024 (Shift-01)

(a) 50 and 26 (b) 35 and 41
(c) 44 and 32 (d) 40 and 36

333. If the sum of two numbers x and y is 12 and their product is 27, then find the sum of their cubes.

SSC CPO 27/06/2024 (Shift-01)

(a) 657 (b) 576
(c) 765 (d) 756

334. The sum of two numbers is 28 and the sum of their squares is 528. Find the square root of the product of both the numbers.

SSC CPO 28/06/2024 (Shift-02)

(a) $8\sqrt{2}$ (b) $2\sqrt{2}$
(c) $4\sqrt{2}$ (d) $6\sqrt{2}$

335. A gear 15 cm in diameter is turning a gear 21 cm in diameter. When the smaller gear has 105 revolutions, how many has the larger one made?

SSC CPO 28/06/2024 (Shift-03)

(a) 75 (b) 100
(c) 85 (d) 90

336. 18 students of a class took part in a quiz. If the number of girls is 8 more than the number of boys, find the product of the number of boys and girls.

SSC CPO 29/06/2024 (Shift-02)

(a) 56 (b) 36
(c) 63 (d) 65

337. If the $\frac{5}{6}$ of a number is 10 less than the number itself, then $\frac{7}{5}$ of the number is ______.

SSC MTS 13/09/2023 (Shift-01)

(a) 96 (b) 72
(c) 60 (d) 84

338. The square of 72 is equal to the product of 216 and a number. Find the number.

SSC CGL 20/07/2023 (Shift-03)

(a) 36 (b) 18
(c) 24 (d) 48

339. If the sum of a number and its reciprocal is 4, find the sum of their squares.

SSC CHSL 17/03/2023 (Shift-01)

(a) 12 (b) 16
(c) 14 (d) 18

340. If sum of squares of two real numbers is 12 and the product of the numbers is 4, find the difference between the numbers.

SSC CHSL 20/03/2023 (Shift-03)

(a) 4 (b) 8
(c) 1 (d) 2

341. 7 is added to a certain number and the sum is multiplied by 5. The product is then divided by 3 and 4 is subtracted from the quotient. If the result comes to 16, then what is the original number?

SSC CGL 08/12/2022 (Shift-03)

(a) 3 (b) 1
(c) 5 (d) 4

342. If A is greater than B by 7, B is greater than C by 16, and A + B + C is 255, then the value of 3A + C – 4B is:

SSC CPO 09/11/2022 (Shift-01)

(a) 5 (b) 10
(c) 8 (d) 4

343. Two positive number differ by 3951. When the larger number is divided by the smaller number, the quotient is 12 and the remainder is 13. The sum of the digits of the larger number is:

SSC CPO 11/11/2022 (Shift-03)

(a) 12 (b) 16
(c) 18 (d) 14

344. 8 apples and 10 oranges weigh 5 kg. 12 apples and 20 oranges weigh 9 kg. What is the weight (in kg, rounded off to the nearest integer) of 15 apples and 24 oranges?

SSC CHSL 08/07/2024 (Shift-03)

(a) 13 (b) 10
(c) 16 (d) 11

345. The cost of 21 pencils and 9 pens is Rs. 276, and the cost of 6 pencils and 3 pens is Rs. 84. The cost of 1 pencil and 1 pen is:

SSC CHSL 10/07/2024 (Shift-03)

(a) Rs. 30 (b) Rs. 40
(c) Rs. 20 (d) Rs. 10

346. The sum of two numbers x and y (where x is greater than y) is equal to four times of their difference. Find the value of $\frac{5xy}{3(x^2-y^2)}$?

SSC CPO 27/06/2024 (Shift-01)

(a) $\frac{25}{16}$ (b) 16
(c) $2\frac{3}{16}$ (d) 25

347. If $847 \times 385 \times 675 \times 3025 = 3^a \times 5^b \times 7^c \times 11^d$, then the value of ab – cd is:

SSC CGL TIER-II 29/01/2022

(a) 4 (b) 5
(c) 1 (d) 7

348. Let a, b and c be the fractions such that a < b < c. If c is divided by a, the result is $\frac{5}{2}$, which exceeds b by $\frac{7}{4}$. If a + b + c = $1\frac{11}{12}$ the (c – a) will be equal to:

SSC CGL TIER-II 11/09/2019

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) $\frac{1}{6}$

349. Find the quotient, when the mean proportional of $7\frac{1}{5}$ and 245 is divided by an even prime number.

SSC CGL 11/09/2024 (Shift-02)

(a) 49 (b) 42
(c) 21 (d) 36

350. How many times does the hour hand and minute hand of a clock coincide in half a day?

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 44 (b) 11
(c) 22 (d) 55

351. Three fraction x, y and z are such that x > y > z, When the smallest of them is divided by the greatest, the result is $\frac{9}{16}$, which exceeds by 0.0625. If x + y + z = $1\frac{13}{24}$, then the value of x + z is:

SSC CGL TIER-II 12/09/2019

(a) $\frac{7}{8}$ (b) 1
(c) $\frac{25}{24}$ (d) $\frac{7}{6}$

352. Find the sum of 6 + 8 + 10 + 12 + 14 .... + 40.

SSC CGL TIER-II 18/11/2020

(a) 424 (b) 1600
(c) 400 (d) 414

353. When a two-digit number is multiplied by the sum of its digits, the product is 424. When the number obtained by interchanging its digits is multiplied by the sum of the digits, the result is 280. The sum of the digits of the given number is:

SSC CGL TIER-II 12/09/2019

(a) 6 (b) 9
(c) 8 (d) 7

354. How many numbers are there from 400 to 700 in which the digit 6 occurs exactly twice?

SSC CGL TIER-II 08/08/2022

(a) 19 (b) 21
(c) 18 (d) 20

355. Ram gives a six-digit number 468312 to Shyam to check the divisibility. Shyam tells Ram that the number is divisible by 57. Shyam asks Ram, "If we rearrange the digits of this number in descending order, then by which number will it be always divisible?"

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 2 (b) 17
(c) 3 (d) 19

356. In a garden, there are 6 daisy plants in first year. Each year, a gardener adds 3 new daisy plants. He has 26 jasmine plants in first year and loses 2 each year. When will the number of daisy plants equal to the number of jasmine plants after the first year?

SSC CGL 12/09/2024 (Shift-02)

(a) 5 years (b) 4 years
(c) 2 years (d) 6 years

357. 2 biscuits and 1 chocolate cost ₹69. 2 chocolates and 3 cups of coffee cost ₹127. 3 biscuits, 4 chocolates and 2 cups of coffee cost ₹229. Find the total cost (in ₹) of 5 biscuits, 5 chocolates and 5 cups of coffee.

SSC CGL 13/09/2024 (Shift-03)

(a) 304 (b) 375
(c) 345 (d) 355

358. Anna and Ben each have a collection of marbles. If Anna gives one marble to Ben, they will both have an equal number of marbles. Conversely, if Ben gives one marble to Anna, she will end up with three times the number of marbles that Ben has. What is the total number of marbles they both have?

SSC CGL 18/09/2024 (Shift-03)

(a) 10 (b) 8
(c) 11 (d) 9

359. Each of Ravi and Kavita had some marbles. Kavita had 12 more marbles than Ravi had. If each of them had one more marble, then three times the number of marbles Kavita would then have had would have been equal to four times the number of marbles Ravi would then have had. How many marbles did Kavita actually have?

SSC CGL 19/09/2024 (Shift-01)

(a) 43 (b) 47
(c) 51 (d) 48

360. Raju has Rs.11,000 and starts saving Rs.5,000 each week towards buying a new laptop. At the same time, Ramesh has Rs.60,000 and begins spending Rs.2,000 per week on supplies for his art class. Will there be a week when they have the same amount of money?

SSC CHSL 05/07/2024 (Shift-01)

(a) Yes, after 7 weeks
(b) Yes, after 6 weeks
(c) No, they will never have the same amount
(d) Yes, after 5 weeks

ANSWER KEY

1.	(a)	2.	(d)	3.	(a)	4.	(c)	5.	(a)	6.	(d)	7.	(a)	8.	(a)	9.	(b)	10.	(d)
11.	(c)	12.	(d)	13.	(d)	14.	(a)	15.	(d)	16.	(c)	17.	(b)	18.	(c)	19.	(c)	20.	(c)
21.	(d)	22.	(b)	23.	(a)	24.	(c)	25.	(c)	26.	(b)	27.	(c)	28.	(a)	29.	(b)	30.	(a)
31.	(d)	32.	(c)	33.	(b)	34.	(a)	35.	(c)	36.	(c)	37.	(c)	38.	(c)	39.	(d)	40.	(c)
41.	(c)	42.	(b)	43.	(d)	44.	(c)	45.	(c)	46.	(d)	47.	(d)	48.	(c)	49.	(d)	50.	(a)
51.	(c)	52.	(c)	53.	(d)	54.	(a)	55.	(a)	56.	(b)	57.	(c)	58.	(c)	59.	(d)	60.	(a)
61.	(a)	62.	(c)	63.	(a)	64.	(c)	65.	(a)	66.	(a)	67.	(d)	68.	(b)	69.	(c)	70.	(a)
71.	(c)	72.	(c)	73.	(c)	74.	(d)	75.	(d)	76.	(c)	77.	(c)	78.	(d)	79.	(b)	80.	(b)
81.	(a)	82.	(c)	83.	(c)	84.	(b)	85.	(a)	86.	(b)	87.	(b)	88.	(c)	89.	(a)	90.	(b)
91.	(b)	92.	(b)	93.	(a)	94.	(d)	95.	(c)	96.	(c)	97.	(b)	98.	(b)	99.	(a)	100.	(a)
101.	(d)	102.	(b)	103.	(d)	104.	(c)	105.	(d)	106.	(d)	107.	(b)	108.	(a)	109.	(b)	110.	(d)
111.	(c)	112.	(c)	113.	(d)	114.	(a)	115.	(b)	116.	(c)	117.	(d)	118.	(a)	119.	(d)	120.	(c)
121.	(d)	122.	(c)	123.	(d)	124.	(c)	125.	(b)	126.	(d)	127.	(b)	128.	(d)	129.	(a)	130.	(c)
131.	(a)	132.	(d)	133.	(b)	134.	(c)	135.	(b)	136.	(c)	137.	(b)	138.	(d)	139.	(b)	140.	(b)
141.	(c)	142.	(d)	143.	(d)	144.	(d)	145.	(b)	146.	(a)	147.	(d)	148.	(b)	149.	(c)	150.	(d)
151.	(b)	152.	(c)	153.	(a)	154.	(a)	155.	(d)	156.	(a)	157.	(a)	158.	(c)	159.	(d)	160.	(a)
161.	(c)	162.	(a)	163.	(c)	164.	(a)	165.	(c)	166.	(b)	167.	(a)	168.	(a)	169.	(d)	170.	(b)
171.	(b)	172.	(a)	173.	(c)	174.	(d)	175.	(c)	176.	(b)	177.	(d)	178.	(d)	179.	(b)	180.	(c)
181.	(d)	182.	(a)	183.	(a)	184.	(d)	185.	(b)	186.	(b)	187.	(d)	188.	(a)	189.	(c)	190.	(b)
191.	(c)	192.	(c)	193.	(d)	194.	(b)	195.	(a)	196.	(a)	197.	(c)	198.	(a)	199.	(c)	200.	(b)
201.	(d)	202.	(c)	203.	(a)	204.	(a)	205.	(c)	206.	(a)	207.	(c)	208.	(c)	209.	(d)	210.	(a)
211.	(c)	212.	(b)	213.	(b)	214.	(c)	215.	(b)	216.	(d)	217.	(b)	218.	(d)	219.	(a)	220.	(c)
221.	(c)	222.	(d)	223.	(c)	224.	(a)	225.	(b)	226.	(c)	227.	(c)	228.	(c)	229.	(d)	230.	(c)
231.	(a)	232.	(c)	233.	(d)	234.	(a)	235.	(c)	236.	(a)	237.	(d)	238.	(b)	239.	(c)	240.	(c)
241.	(d)	242.	(a)	243.	(c)	244.	(d)	245.	(d)	246.	(b)	247.	(c)	248.	(b)	249.	(d)	250.	(d)
251.	(d)	252.	(b)	253.	(d)	254.	(b)	255.	(b)	256.	(d)	257.	(b)	258.	(d)	259.	(b)	260.	(b)
261.	(a)	262.	(c)	263.	(b)	264.	(d)	265.	(b)	266.	(a)	267.	(c)	268.	(d)	269.	(c)	270.	(c)
271.	(a)	272.	(c)	273.	(b)	274.	(d)	275.	(c)	276.	(d)	277.	(b)	278.	(a)	279.	(d)	280.	(a)
281.	(d)	282.	(c)	283.	(d)	284.	(b)	285.	(c)	286.	(a)	287.	(d)	288.	(a)	289.	(a)	290.	(a)
291.	(c)	292.	(a)	293.	(d)	294.	(d)	295.	(b)	296.	(b)	297.	(c)	298.	(c)	299.	(c)	300.	(b)
301.	(b)	302.	(d)	303.	(b)	304.	(c)	305.	(b)	306.	(a)	307.	(a)	308.	(a)	309.	(c)	310.	(b)
311.	(d)	312.	(c)	313.	(b)	314.	(a)	315.	(c)	316.	(c)	317.	(b)	318.	(d)	319.	(b)	320.	(c)
321.	(a)	322.	(a)	323.	(a)	324.	(c)	325.	(c)	326.	(c)	327.	(b)	328.	(c)	329.	(b)	330.	(a)
331.	(b)	332.	(a)	333.	(d)	334.	(a)	335.	(a)	336.	(d)	337.	(d)	338.	(c)	339.	(c)	340.	(d)
341.	(c)	342.	(a)	343.	(b)	344.	(d)	345.	(c)	346.	(a)	347.	(b)	348.	(b)	349.	(c)	350.	(b)
351.	(c)	352.	(d)	353.	(c)	354.	(d)	355.	(c)	356.	(b)	357.	(d)	358.	(b)	359.	(b)	360.	(a)

SOLUTIONS

1. (a) If the sum of all 5 prime numbers is odd then all the numbers will be odd i.e. there will be no even prime number 2 among them.

So, if any of the numbers is removed then the sum of the remaining 4 numbers will be even.

∵ The sum of 4 odd numbers is even.

2. (d) No two consecutive even numbers are co-prime.

3. (a) Let, by putting the values of a and b as 3 and 5 respectively,

a : b – a

3 : 2 (co-prime)

b : b + a

5 : 8 (co-prime)

So, the numbers a and b are co-prime

Option (b) is correct

4. (c) From the given options:

HCF (39, 68) = 1

Those numbers which are not divisible by any number other than 1 and themselves are called prime numbers.

5. (a) (198 and 175 are coprime numbers as they have number common factors. So option (a) is correct.

6. (d) If any number N has only two factors 1 and N, Then the number is the Prime Number.

Option(d) 89 has only two factors which are 1 and 89 only.

Hence, Option(d) is correct.

7. (a) 729 is a square of 27.

So, prime number smaller than 27 = 2, 3, 5, 7, 11, 13, 17, 19, 23

Option (a) 701 is not divisible any prime number which is smaller than 27. Hence, 701 is prime number.

Option (b) 679 is divisible by 7.

Option (c) 657 is divisible by 3.

Option (d) 697 is divisible by 17.

8. (a) Taking the value of K from the options,

Let, K = 2

$K^2 + 3 = 4 + 3 = 7$

$K^3 + 5 = 8 + 5 = 13$

Hence, if both 7 and 13 are prime numbers, then option (a) is satisfied.

9. (b) Smallest perfect square number of five digit = 10000 = $(100)^2$

Prime numbers less than 100 = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

By Option

(a) 10001 is divisible by 73.

(b) 10007 is not divisible by any prime number which is samller than 100. Hence, 10007 is prime number.

(c) 1003 is four digit number.

(d) 10009 is not divisible by any prime number which is samller then 100. Hence, 10009 is prime number.

10007 and 10009 is prime number but 10007 will be samllest 5 digit number.

10. (d) Prime No. between 20 and 50

= 23, 29, 31, 37, 41, 43, 47

∴ Total no. = 7

11. (c) Prime number between 100 and 120 = 101, 103, 107, 109, 113

∴ Total = 5

12. (d) Let, the numbers a, b, c

ATQ,

a × b = 391, b × c = 943

HCF 391 and 943 = 23

Number in between = 23

13. (d) Let, three numbers be x, y, 2.

$x + y + 2 = 72$

Given, $x = y + 24$

ATQ,

$y + 24 + y + 2 = 72$

$\Rightarrow 2y + 2 = 48 \Rightarrow y = \dfrac{48-2}{2}$

$\Rightarrow y = 23$

Value of $x = 72 - (y + 2) \Rightarrow x = 47$

Alternate Method:

ATQ,

Option (a) satisfies = 47 + 23 + 2 = 72

and all the three numbers are prime

14. (a) Product of first three numbers = 255

255 = 3 × 5 × 17

Product of last three numbers = 1955 1955 = 17 × 23 × 5

Hence, largest prime number = 23

15. (d) ATQ,

$z > y > x \Rightarrow x + y + z = 70$

Now, Sum is 70, means at least one of the number is even because,

odd + odd + odd = odd

We know that,

2 is only even and smallest prime number

y + z = 70 – 2 = 68

From option (d) z = 37 ⇒ y = 31

Alternate Method:

Given, $x + y + z = 70$

Using options, let z = 37

$\Rightarrow x + y = 33$

∵ 2 + 31 = 33

Where, 2 and 31 are prime no.

$x < y < z.$

16. (c) The product of two numbers can be prime only if one number is prime and the other is '1'.

Hence, the possibilities of prime unit digits are, 2, 3, 5, 7 numbers

⇒ 1112, 1113, 1115, 1117

∴ Total 4 numbers are possible.

17. (b) ATQ, No. are -

13, 31, 17, 71, 37, 73, 79, 97

Sum = 13 + 31 + 17 + 71 + 37 + 73 + 79 + 97 = 418

18. (c) Composite no. has more than two factor

Composite no. b/w 23 & 43

= 24, 25, 26, 27, 28, 30, 32, 33, 34, 35, 36, 38, 39, 40, 42

∴ Total no. = 15

Alternate Method:

Total number between 23 & 43

= 20 – 1 = 19.

Total prime number between 23 & 43 = 29, 31, 37, 41 = 4 numbers

∴ Total composite number between 23 & 43 = 19 – 4 = 15

19. (c) Total numbers from 53 to 97

= 97 – 53 + 1 = 45

Prime numbers = 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

Total prime no = 10

Total composite no.= 45 – 10 = 35

20. (c) Whole numbers between 11^2 (121) and 12^2 (144)

= (144 – 121) – 1

= 23 – 1 = 22

21. (d) $6 < \sqrt[3]{N} < 7$

Taking cubes 216 < N < 343

Possible no. = (343 – 216 + 1) – 2

= (128 – 2) = 126

22. (b) $(263)^{149} + (263)^{150} + (263)^{151}$

unit digit $(3^1 + 3^2 + 3^3)$

(3 + 9 +27) = 39 → 9 (unit digit)

∴ $(263)^{149} + (263)^{150} + (263)^{151}$ unit digit is 9

23. (a) Unit digit of the expression 67^{32} is the same as 7^{32}.

Unit digit in the expression is:

$7^{32} = 7^4 = 1$

(32 is divisible by 4 completely, and the unit digit of 7 starts repeating after 4th power.)

∴ Unit digit of $67^{32} = 1$

24. (c) Cyclicity of 3 is 4.

Now, 99 = 4 × 24 + 3

$\therefore (3)^{99} = (3)^{4 \times 24 + 3} = (3)^3 = 27$

∴ Unit digit of $(3)^{99}$ is 7.

25. (c) To find unit digit power is divided by 4

∴ 73 when divided by 4, remainder is 1.

∴ unit digit = $7^1 = 7$

26. (b) $3^{98} - 3^{89}$, to find unit digit divide power by 4 i.e. when 98 and 89 divide by 4, 2 and 1 are remainder respectively.

$3^2 - 3^1 = 6$

∴ option (b) is correct.

27. (c) $x = (164)^{169} + (333)^{337} - (727)^{726}$

Firstly divide power by 4 (by cyclicity rule)

Unit digit = $(4)^1 + (3)^1 - (7)^2$

= 4 + 3 – 9 = 7 – 9 = –2

Unit digit alway positive

= –2 + 10 = 8

Note: If the units digit is negative then it is added to 10 because the units digit is never negative.

28. (a) $x = 3^4 - 7^2 + 6$

$= 1 - 9 + 6$

$= 7 - 9 = -2 = -2 + 10 = 8$

29. (b) $S = 9^{27} + 27^9$

unit digit of $9^{27} = 9$

and unit digit of $27^9 = 7^9 = 7^1 = 7$

∴ Unit digit of $S = 9 + 7 = 6$

30. (a) When any number is divided by 1000 then remainder is equal to last three digit of that number.

$\frac{(225)^{40}}{1000} = \frac{5^{80} \times 9^{40}}{1000} = \frac{5^{77} \times 9^{40}}{8}$

Also, $9^{40} = (8 + 1)^{40}$ gives remainder 1 when we divide it by 8.

$\frac{5^{77}}{8} = \frac{5.(24+1)^{38}}{8}$ leaves a remainder 5

So, last three digits of $(225)^{40}$

$= 125 \times 5 = 625$

So, the value at hundered place is 6.

31. (d) Let, unit digits be X

Unit digit can take value of 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

When X = 0, the number is divisible by 2 i.e. m even and hence not prime similarly for X = 4, 6 & 8

When X = 1, 2, 3, 5, 7, 9

Hence, such digits of X are possible = 6

X can takes 6 values.

32. (c) We know odd prime upto 110 has single number '5' at unit digit and any number multiplied by 5 gives unit digit '5'.

Alternate Method:

odd primes upto 110 are :

3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109.

Common unit digits

$= 1^6 \times 3^8 \times 5^1 \times 7^7 \times 9^6$

$= 1 \times 1 \times 5 \times 3 \times 1 = 5$

33. (b) Multiply the last three digit of both the given number

$345 \times 789 = 272205$

∴ Last 3 digits are 205.

Alternate Method:

Divide the number by 1000 to find the last three digits

$\frac{345 \times 789}{1000} = \frac{69 \times 789}{200}$,

$R = \frac{69 \times -11}{200} = \frac{-759}{200}$

$\Rightarrow R = -(-41) = 41$

Real remainder $= 41 \times 5 = 205$

Last 3 digits are 205

34. (a) $3600 = 2^4 \times 3^2 \times 5^2$

Number of factors $= (4 + 1)(2 + 1)(2 + 1)$

∴ Number of factors $= 5 \times 3 \times 3 = 45$

35. (c) $360 = 2^3 \times 3^2 \times 5^1$

I. Number of factors $= (3 + 1) \times (2 + 1) \times (1 + 1) = (4) \times (3) \times (2) = 24$

∴ (I) Statement is correct.

II. Sum of all factors of 360:

$(2^0 + 2^1 + 2^2 + 2^3)\ (3^0 + 3^1 + 3^2)\ (5^0 + 5^1)$

$= (1 + 2 + 4 + 8) \times (1 + 3 + 9) \times (1 + 5)$

$= 15 \times 13 \times 6 = 1170$

∴ It is also true.

∴ Both statements 1 & 2 are correct.

36. (c) $N = 12^6 \times 3^8 \times 5^3$

$= (2^2 \times 3^1)^6 \times 3^8 \times 5^3$

$= 2^{12} \times 3^{14} \times 5^3$

(1) Number of odd factors

$= 15 \times 4 = 60$

∴ Statement 1 is correct.

(2) Number of even factors

$= 12 \times 15 \times 4 = 720$

∴ Statement 2 is also correct.

Both (1) and (2) statement are correct.

37. (c) Prime factorization of 216

$= 2^3 \times 3^3$

Sum of odd divisors

$= (3^0 + 3^1 + 3^2 + 3^3)$

$= (1 + 3 + 9 + 27) = 40$

38. (c) Factors of prime number 1 and the number itself

39. (d) $720 = 2^4 \times 3^2 \times 5^1$

Total number of factor $= (4 + 1)(2 + 1)(1 + 1) = 5 \times 3 \times 2 = 30$

But 1 and 720 excluded

∴ Required no. of factors $= 30 - 2 = 28$

40. (c) $38808 = 2^3 \times 3^2 \times 7^2 \times 11$.

Total number of factors $= (3 + 1)(2 + 1)(2 + 1)(1 + 1) = 4 \times 3 \times 3 \times 2 = 72$

∴ 1 & the number itself is excluded

∴ Number of divisors $= 72 - 2 = 70$

41. (c) $N = 1000$

$\Rightarrow N = 2^3 \times 5^3$

Number of divisors of N

$= (3 + 1)(3 + 1)$

$= 16 - 2$ (excluding 1& 1000) $= 14$

42. (b) $840 = 2^3 \times 3^1 \times 5^1 \times 7^1$

Total no. of factors $= 4 \times 2 \times 2 \times 2 = 32$

What 1 and the number itself are excluded.

Required factor $= (32 - 2) = 30$

43. (d) Prime factor of 26381

$= 23 \times 31 \times 37$

44. (c) If a, b, c are prime number , then number of prime factors of

$a^x \times b^y \times c^z = (x + y + z)$

$N = (30)^5 \times (24)^5$

$= 2^5 \times 3^5 \times 5^5 \times 2^{15} \times 3^5$

$= 2^{20} \times 3^{10} \times 5^5$

∴ Number of prime factors

$= 20 + 10 + 5 = 35$

45. (c) Given, N has 15 distinct divisors

$N = P_1^a \times P_2^b$

Total factor $= (1 + a)(1 + b)$

$(1 + a)(1 + b) = 15 = 3 \times 5$

$(1 + a)(1 + b) = (1 + 2)(1 + 4)$

$\therefore a = 2, b = 4$

$N = P_1^2 \times P_2^4$

$N^2 = P_1^4 \times P_2^8$

No. of factors $= (4 + 1)(1 + 8)$

$= 5 \times 9 = 45$

46. (d) All prime factors of 1560

$= 2^3 \times 3 \times 5 \times 13$

Sum of prime factors

$= 2 + 3 + 5 + 13 = 23$

⇒ 41 more then 23

∴ Option (d) will satisfy.

47. (d) Factors of 196 = 1, 2, 4, 7, 14, 28, 49, 98, 196

Number of factors which are divisible by 4 = 3

Alternate Method:

$196 = 2^2 \times 7^2$

$= (2^0 + 2^1 + 2^2) \times (7^0 + 7^1 + 7^2)$

$= (1 + 2 + 4) \times (1 + 7 + 49)$

Now,

$\Rightarrow 4 \times 1, 4 \times 7, 4 \times 49$

Total three number divisible by 4

48. (c) Factor of 484

⇒ 1, 2, 4, 11, 22, 28, 44, 121, 242, 482

Now, Among all the factor 484 → 1, 4, 121, 484

$\Rightarrow 1 + 4 + 121 + 484 = 610$

Alternate Method:

$484 = 2^2 \times 11^2$

∴ Sum of perfect square factor

$= (2^0 + 2^2)(11^0 + 11^2)$

$= (1 + 4)(1 + 121) = 610$

49. (d) Factors of $14400 = 2^6 \times 3^2 \times 5^2$

Factors of $18 = 2 \times 3^2$

Factors of $36 = 2^2 \times 3^2$

Factors which are divisible by 18

$= \frac{2^6 \times 3^2 \times 5^2}{2 \times 3^2} = 2^5 \times 5^2$

Total number of factors which are divisible by 18 $= (5 + 1) \times (2 + 1) = 18$

Factors which are divisible by 36

$= \frac{2^6 \times 3^2 \times 5^2}{2^2 \times 3^2} = 2^4 \times 5^2$

Total number of factors which of divisible by 36 $= (4 + 1) \times (2 + 1) = 15$

∴ Required factors $= 18 - 15 = 3$

50. (a) To divide any number from 2 and 5 both, take LCM (2 and 5) = 10.

The number which is divisible by 10 is divisible by 2 and 5 both.

So, option (a) is correct.

51. (c) **For the divisibility of 5:-** Last digit must be 0 or 5.

⇒ Option (a) and (b) eliminated.

Divisibility of 11:- Sum of odd place digit – Sum of even place = 0 or 11

By option,

⇒ 5 8 9 2 7 0

$\Rightarrow (5 + 9 + 7) - (8 + 2 + 0) = 0$ or multiple of 11

$\Rightarrow 21 - 10 = 11$

So, 589270 is divisible by 2, 5, 10 and 11.

52. (c) For the divisibility of 8, last three digit of number must be divisible by 8.

$\frac{344}{8} \Rightarrow R = 0$ (completely divisible)

$\frac{544}{8} \Rightarrow R = 0$ (completely divisible)

$\frac{608}{8} \Rightarrow R = 0$ (completely divisible)

$\frac{497}{8} \Rightarrow R = 1$ (Not completely divisible by 8)

Alternate Method:
7497 is odd number
So, it is not divisible by 8.

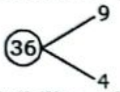
53. (d) Given no = 429714
Unit digit of given no. is not zero and 5. So, it will not divisible by 5.
So, option (a) and (b) eliminated.
The last two digit of the given no. is not divisible by 4.
Sum of digit = 4+2+9+7+1+4 = 27
$\frac{27}{3} \rightarrow R = 0$
Unit digit = 4
Number is divisible by 2, 3, & 6
Hence, the no. is divisible by 3 & 6.

54. (a) **Divisibility rule of 8:** last 3 digits are divisible by 8
From option (a)
$6816 \rightarrow \frac{816}{8} \Rightarrow R = 0$

55. (a) Last 2 digits of the given number are divisible by 4.
So, option (a) satisfy the value. because last two digit of number is divisible by 4.

56. (b) Given number → 2918245
Divisibility of 11 → If the diff. between sum of odd and even place digit is 0 or multiple of 11
$(9 + 8 + 4) - (2 + 1 + 2 + 5) = 21 - 10 = 11$
Hence, the given number is divisible by 11.

57. (c) Given no. 55512



Divisibility rule of 9:-
$\frac{5+5+5+1+2}{9} = \frac{18}{9} \rightarrow R = 0$
Divisibility rule of 4: $\frac{12}{4} \rightarrow R = 0$
Hence, the given no. is divisible by 36.

58. (c) If the sum of the digits of the number is divisible by 3, then number is divisible by 3.

59. (d) **Divisibility rule of 3:-** Sum of digits should be divisible by 3.
$\frac{436P5}{3} \Rightarrow \frac{4+3+6+P+5}{3} = \frac{18+P}{3}$
Hence, max^m value of P = 9

60. (a) **Divisibility of 3:-** The sum of digits must be divisible by 3.
7_7624 = 7 + x + 7 + 6 + 2 + 4
= 26 + x
Smaller value of x must be 1 to completely divide the number by 3.

61. (a) **Divisibility rule of 3:** sum of digit divisible by 3
$379843 \rightarrow 3 + 7 + 9 + 8 + 4 + 3 = 34$
Now, $\frac{34}{3} \rightarrow R = 1$

62. (c) Since, 2 x 3 is divisible by 3 for maximum value for x.
Then, we know, x = 7
(273 is divisible by 3)
$\therefore x^2 + x = 49 + 7 = 56$

63. (a) Given number 5306P2 is divisible by 3
Divisibility of 3: sum of digit should be divisible by 3
Digit sum = 5 + 3 + 0 + 6 + P + 2
⇒ 16 + P
P = 8 (maximum), P = 2 (minimum)
Required diff. = $8^2 - 2^2 = 60$

64. (c) **Divisibility by 3:** sum of digit of number should be divisible by 3.
$6745k2 = \frac{6+7+4+5+k+2}{3}$
$= \frac{24+k}{3}$, put k = 3, 6, 9
$\therefore k_{max} = 9$

65. (a) **Divisibility of 9:** Sum of digits must be divisible by 9.
28735429 → 2 + 8 + 7 + 3 + 5 + 4 + 2 + 9 = 40 = 36 + 4
36 is divisible by 9. So, remainder is 4.
Note: If we divide any number by 9 then, its digit sum will be remainder so, 4 is the digit sum of given number.

66. (a) **Divisibility rule of 9:-** = Sum of digits of the number is divisible by 9
⇒ 5 + 7 + x + 7 + 1 + 6
⇒ 26 + x
$\therefore x = 1$

67. (d) **Divisibility of 9:-** Sum of digit must be divisible by 9.
6428A83 → 6 + 4 + 2 + 8 + A + 8 + 3
= 31 + A ⇒ A = 5

68. (b) $\frac{627x5}{9}$
Divisibility rule of 9:- Sum of all digit divisible by 9.
Now, $\frac{6+2+7+x+5}{9} = \frac{20+x}{9} \rightarrow x = 7$

69. (c) **Divisibility rule of 9:-** Sum of digits of a number is divisible by 9
By option (c) = 553986
$= \frac{5+5+3+9+8+6}{9} = \frac{36}{9} \Rightarrow R = 0$

70. (a) **Divisibility rule of 9:-** Sum of digits of the number is divisible by 9
ATQ,
$\Rightarrow \frac{7+2+*+7+2}{9} = \frac{18+*}{9} \Rightarrow * = 0, 9$

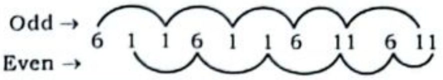
71. (c) If sum of digits of any number is divisible by 9 then the number is also divisible by 9.
4 + 8 + 3 + 9 + 7 + k + 5
∴ k = 9

72. (c) **Divisibility of 3:-** A number is divisible by 3 If sum of digit of number is divisible by 3.
Divisibility of 9:- A number is divisible by 9 If sum of digit of number is divisible by 9.
Thus, Numbers that are divisible by 3 but not 9 are 5826, 5964, 6564, 6960.
Required Numbers = 4.

73. (c) Given 846523X7Y is divisible by 9.
Using divisibility rule of 9,
X + Y = 10 ...(i)
ATQ,
Y – X = 6 ...(ii)
On solving (i) & (ii), we get–
Y = 8, X = 2
$\therefore \sqrt{2X+4Y} = \sqrt{36} = 6$

74. (d) Given no 5m83m4m1 is divisible by 9
Divisibility of 9: sum of digit should be divisible by 9
⇒ 5 + m + 8 + 3 + m + 4 + m + 1
⇒ 21 + 3 m
Smallest value of m = 2
Largest value of m = 8
∴ Product of smallest and largest value = 8 × 2 = 16

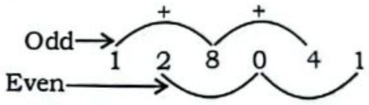
75. (d) Given number is odd so it is not divisible by 6
Divisibility of 11:- Sum of odd place digit – Sum of even place = 0 or 11.



difference = 0
= The given no. is divisible by 11 only.

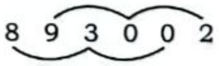
SMART APPROACH:-
Since, The given no. is not divisible by 6.
Because last digit of the number is odd.
So, option (a) and (c) eliminated.
Now, only check 11 divisibility,
16 – 16 = 0
Hence, the given number is divisible by 11 only.

76. (c) **Divisibility of 11:-** Sum of odd place digit – Sum of even place = 0 or 11



∴ 13 – 3 = 10
∴ 128041 is not divisible by 11

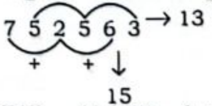
77. (c) 22 = 2 × 11
For the divisibility of 2:- last digit should be 0, 2, 4, 6, 8 option (b) eliminated.
Divisibility of 11:- Sum of odd place digit – Sum of even place = 0 or 11.



(8 + 3 + 0) – (9 + 0 + 2) = 0 or multiple of 11
11 – 11 = 0
0 = 0
893002 is divisible by 22.

78. (d) **Divisibility rule of 11:**
Odd place – Even place
= 0 or Multiple of 11
ATQ,
958749
(9 + 8 + 4) – (5 + 7 + 9)
21 – 21 = 0
Hence, the given no. is divisible by 11.

79. (b) **Divisibility of 11:** if the diff. between sum of odd and even place digit is 0 or multiple of 11



Diff. = 15 – 13 = 2 ≠ 0 or multiple of 11
On solving, we get 752563 is not divisible by 11.

80. (b) 99 = 9 × 11
Divisibility of 9: A number is divisible by 9 If sum of digit of number is divisible by 9.

Divisibility of 11: If the diff. between sum of odd and even place digit is 0 or multiple of 11

On checking options, we find that option(a) is not divisible by 9 and Option (c) & (d) is not divisible by 11.

Thus, Required Answer is (b).

81. (a) **Divisibility of 11:** If the diff. between sum of odd and even place digit is 0 or multiple of 11.
In option (a), we find that
$(5 + 1 + 3 + 1) - (2 + 4 + 4) = 0$
Thus, option (a) is divisible by 11.

82. (c) The no 30a68b is divisible by 11
$(3 + a + 8) - (6 + b) = 0$ or multiple of 11
$(11 + a) - (6 + b) = 0$ or multiple of 11
for greatest value of b
$a = 9$
So, $b = 3$
$= (11 + 9) - (6 + 3)$
$= 20 - 9 = 11$

83. (c) 5A72B is divisible by 11
5 A 7 2 B
$\Rightarrow (5 + 7 + B) - (A + 2) = 0$ or multiple of 11
$\Rightarrow 12 + B - A - 2 = 11$
$\Rightarrow B - A = 1$

84. (b) **Divisibility rule of 11:-** Sum of odd place – sum of even place = 0, or 11
Now, 7 8 4 5 K 8 5 4
$(16 + K) - 25 = 0$
$\Rightarrow K - 9 = 0$
$\Rightarrow K = 9$

85. (a) 6954P is divisible by 11.
For the divisibility of 11:- If the diff. between the sum of digits at odd places and sum of digits at even places is 0 or multiple of 11.
6 9 5 4 P
$\Rightarrow (11 + P) - 13 = 0$ or multiple of 11
$\therefore P = 2$

86. (b) **Divisibility of 11:-** Sum of odd place digit – Sum of even place = 0 or 11
D = 756148 is not divisible by 11.
$(7 + 6 + 4) - (5 + 1 + 8)$
$= 17 - 14 = 3$

87. (b) **Divisibility of 11:-** Sum of odd place digit – Sum of even place = 0 or 11.
Even → = 14
Odd → 7 2 7 8 7 4 5 = 26
$\Rightarrow \frac{26-14}{11} = \frac{12}{11} = 1$ Remainder
$\therefore$ 1 must be subtracted from the given number.

88. (c) 3c2933k
For divisibility of 5, k = 0 or 5
Divisibility of 11:- Sum of odd place digit – Sum of even place = 0 or 11.
$(3 + 2 + 3 + k) - (c + 9 + 3) = 0$ or 11
$\Rightarrow 8 + k - c - 12 = 0$ or 11
$\Rightarrow 8 + 5 - c - 12 = 0$ or 11
$\Rightarrow 1 - c = 0$
$\Rightarrow c = 1$
$\therefore c + k = 5 + 1 = 6$

89. (a) A no. is divisible by 11 if and only if the difference of the sum of the digits in the even and odd position in the number is 0 or multiple of 11.

90. (b) **Divisibility of 11:-** A no. is divisible by 11 if and only if the difference of sum of digits in the even and odd positions in the number is 0 or multiple of 11.
1 2 3 4 5 6 7 y
$(7 + 5 + 3 + 1) - (2 + 4 + 6 + y) = 0$ or multiple of 11.
$16 - 12 - y = 0$
$4 - y = 0 \Rightarrow y = 4$

91. (b) **Divisibility rule of 11:**
The given no. can only be completely divisible by 11 if the difference of the sum of digits at odd positions and sum of digit at even positions in a number is 0 or a multiple of 11.
Now, 7 2 3 5 *
$\frac{10+*-7}{11} \Rightarrow R = 0, 11$
$\Rightarrow \frac{3+*}{11} \Rightarrow * = 8$

92. (b) If last two digits of any number is divisible by 4 then the whole number is divisible by 4.
We replace P by 2, 8, 0 ⇒ (24), (84), (04) are divisible by 4. But the largest value of P = 8

93. (a) **Divisibility rule of 4 →** If the last two digits of a number are divisible by 4, then that number is a multiple of 4 and is divisible by 4 completely
$k53206k \rightarrow \frac{6k}{4} \Rightarrow k = 4, \frac{64}{4} \rightarrow R = 0$

94. (d) 87m6203m
$m = 0, 2, 4, 6, 8$
$8 + 7 + 6 + 2 + 0 + 3 + 2m$
$= 26 + 2m$
With 0, Sum = 26 not divisible by 3.
With 2, Sum = 30 divisible by 3.
With 4, Sum = 34 not divisible by 3.
With 6, Sum = 38 not divisible by 3.
With 8, Sum = 42 divisible by 3.
Sum of all possible values of m
$= 2 + 8 = 10$

95. (c) $6 = 2 \times 3$
For the divisibility of '2' last digit should be 0, 2, 4, 6, 8
For the divisibility of '3' sum of digits must be divisible by 3.
$217924k = 2 + 1 + 7 + 9 + 2 + 4 + k$
$= 25 + k$
$\Rightarrow k = 2$ to make it divisible by 3.
$\therefore k = 2$

96. (c) **Divisibility rule of 6:-** Any number which is divisible by 6, is also divisible by 2 and 3.
The given number = 723*56*
Divisibility of 2:- Last digit should be 0, 2, 4, 6, 8.
option (b) and (d) eliminated.
Divisibility of 3:- Sum of digits must be divisible by 3.
$723*56* = 7 + 2 + 3 + * + 5 + 6 + *$
$= 23 + 2 + 2$
for divisibility of 3, * should be 2.

97. (b) **Divisibility rule of 6:-** The number should be divisible by 2 and 3.
Divisibility of 3 → Sum of digits should be divisible by 3.
$321y72 = \frac{3+2+1+y+7+2}{3}$
$= \frac{15+y}{3} = 0$ Remainder.
So, y's least value = 0.

98. (b) $6 = 2 \times 3$
For the divisibility of 2: last digit should be 0, 2, 4, 6, 8.
For the divisibility of 3: sum of digits must be divisible by 3.
$249k876 = 2 + 4 + 9 + k + 8 + 7 + 6 = 36 + k$
For divisibility of 3, k = 0, 3, 6, 9
But we have been asked least value of k
$\therefore k = 0$

99. (a) **Divisibility rule of 8** = the last three digit of number must be divisible by 8.
$91876a2 \rightarrow \frac{6a2}{8} \Rightarrow a = 3, 7$
So, smallest value of a = 3

100. (a) $\frac{r}{8} = 3$ Remainder
Then,
$\frac{(r^2+6r+7)}{8} = \frac{[(3)^2+6\times3+7]}{8}$
$= \frac{9+18+7}{8} = \frac{34}{8} = 2$ Remainder.

101. (d) **Divisibility rule of 8:-** Last three digits of a number are divisible by 8.
$\Rightarrow \frac{2*4}{8} \Rightarrow * = 2$ (Smallest integer)

102. (b) 123456xy
⇒ 6xy is divisible by 8
00, 08, 16,.........96
$N = \frac{96-00}{8} + 1 = 13$
So, possible pair is 13.

103. (d) Here, 6*2 must be divisible by 8.
putting value of *
⇒ * = 3 as 632 is divisible by 8.
Hence, the smallest possible value of * such that the number is divisible by 8 is '3'.

104. (c) **Divisibility of 12:** = (3 × 4)
Divisibility of 4 : Last 2 digits must be divisible by 4.
$\frac{1738b9c}{4} \rightarrow c = 2, 6$

Divisibility of 3: Sum of digits must be divisible by 3.

$1 + 7 + 3 + 8 + b + 9 + c = 28 + b + c$

When $c = 2, b = 3$

When $c = 6, b = 2, 5$

∴ Lowest positive value of $c - b$

$= 6 - 5 = 1$

105. (d) Given that no. is divisible by 12 it means it is also divisible by 3 and 4.

Divisibility of 3: sum of digit must be divisible by 3

$$\frac{7+1+2+x+8+1+6}{3} = \frac{7+x}{3}$$

$\therefore x = 2$

106. (d) Given Number 7823326867X is divisible by $18 = 2 \times 9$

Using divisibility rule of 9

Digital sum(7823326867X) = 52 + X

Value of 'X' = 2

107. (b) 62684*# is divisible by 5 and 8 both # should be 0 because of 8 divisibility.

4 * 0 is divisible by 8

The place of * = 4, 8, 0

From options the place of * and # is 4 and 0

108. (a) Given,

72864*$ is divisible by 8 and 5 both $ should be 0 because of 8 divisibility

then $ = 0

Last 3 digit i.e. 4*0 divisible by 8.

then * possible value = 4, 8, 0

From option the place * & $ = 4 & 0

109. (b) **Divisibility of 5:-** unit digit must be 0 or 5.

Divisibility of 8:- Last three digit must be divisible by 8

Given,

62684xy is divisible by 8 and 5 = 40

$\Rightarrow y =$ '0'

So, $\frac{4x0}{8} \Rightarrow x = 0, 4, 8$

$\therefore (x, y) = (4, 0)$

110. (d) $36 = 9 \times 4$

For the divisibility of 4:- last two digit must be divisible by 4.

$$\frac{5x79856y6}{4} \Rightarrow y = 1, 3, 5, 7, 9$$

For the divisibility of 9, sum of digits must be divisible by 9.

$5x79856y6 \Rightarrow 5 + x + 7 + 9 + 8 + 5 + 6 + 9 + 6 = 55 + x$

for divisibility of 9, $x = 8$

$$\therefore \sqrt{2x+y} = \sqrt{2\times8+9} = \pm\sqrt{25}$$

$= \pm 5$

But we take − 5 because negative value of $\sqrt{2x+y}$ is asked.

111. (c) $\underline{45yz0}$

$$\begin{array}{c} 40 \\ \swarrow \ \searrow \\ 5 \times 8 \end{array}$$

Divisibility rule of 8:- Last three digits of a number is divisible by 8.

So, $\frac{yz0}{8}$

For maximum value of y + z

$y = 8, z = 8$

$\therefore y + z = 16$ (maximum)

112. (c) Divisible by 72 → (8×9)

Divisibility of 8:- last three digit must be divisible by 8.

$\Rightarrow$ 489y5z6

$\Rightarrow z = 3, 7$

Divisibility of 9:- Sum of digits should be divisible by 9.

$489y5z6 \Rightarrow 4 + 8 + 9 + y + 5 + z + 6$

$= 32 + y + z$

when $z = 3, y = 1$

when $z = 7, y = 6$

Highest possible product of y and z

$= 7 \times 6 = 42$

113. (d) Given number 389x6378y is divisible by $72 = 8 \times 9$

Divisibility of 8:- Last 3 digits is divisible by 8

$\frac{78y}{8} \Rightarrow y = 4$

Divisibility of 9:- Sum of digits is divisible by 9

$$389x63784 = \frac{48+x}{9} \Rightarrow x = 6$$

$\therefore 6x + 7y = (6 \times 6) + (7 \times 4) = 64$

114. (a) $72 = 9 \times 8$

Divisibility of 8: last 3 digit must be divisible by 8.

$$= \frac{37n}{8} \Rightarrow n = 6$$

Divisibility of 9: sum of digits must be divisible by 9.

$$\frac{1+0+3+9+m+8+3+7+6}{9} = \frac{37+m}{9}$$

$\Rightarrow m = 8$

$$\therefore \frac{n^2 - m}{4} = \frac{36-8}{4} = 7$$

115. (b) 6p5157q is divisible by 88 (11×8)

Divisibility of 8: Last 3 digit must be divisible by 8.

$\frac{57q}{8} \rightarrow q = 6$

Divisibility of 11: Sum of odd place digit − Sum of even place = 0 or 11.

$6p5157q \Rightarrow (6 + 5 + 5 + q) - (p + 1 + 7) = 0$ or multiple of 11

$\Rightarrow (16 + q) - (p + 8) = 0$ or multiple of 11

$\Rightarrow 22 - (p + 8) = 0 \Rightarrow 14 - p = 0$

$\Rightarrow p = 3, \quad p \neq 14$

$\therefore pq = 3 \times 6 = 18$

116. (c) Any number which is divisible by 99 will always be divisible by 9.

For exp. = 198 is divisible by 99 & 9.

After shuffling number 189 is divisible by 9.

117. (d) Factors → 72

$$\begin{array}{c} 72 \\ \swarrow \ \searrow \\ 8 \quad 9 \end{array}$$

Divisibility of 8 : Last 3 digit of number should be divisible by 8.

Divisibility of 9 : Sum of digit of number should be divisible by 9.

$\frac{a52}{8} = 0$(put $a = 1$)

$\frac{152}{8} = 0$ (Remainder)

Now,

Sum of digit of number

$= 4 + 6 + 4 + 5 + 1 + 5 + 2 = 27$

27 is divisible by 9.

Hence, value of $a = 1$.

118. (a) 725yz

∵ Number is divisible by 15 $\begin{cases} 5 \\ 3 \end{cases}$

Then $z = 5$

∵ $7 + 2 + 5 + y + 5 = (19 + y)$.

Maximum value of y for which (19 + y) is divisible by 3 is 8

$\therefore z \times y = 5 \times 8 = 40$

119. (d) No. → 15x1y2 (given)

$$\text{(44)} \begin{cases} 4 \\ 11 \end{cases}$$

Divisibility rule of 4 last two digit divisible by 4

$\frac{1y2}{4} \rightarrow y = 1$

Divisibility rule of 11: Odd place − Even place = 0 or Multiple of 11

1 5 x 1 1 2

$= 8 - (2 + x) = 11$ or $0 \Rightarrow x = 6$,

$x + y = 6 + 1 = 7$

120. (c) Given No. → 11p9q4

for divisible by 24 (8×3)

Divisibility of 8: last 3 digit must be divisible by 8

$$\frac{9q4}{8}\ (q = 0,\ 4,\ \underset{\text{max}}{\underset{\downarrow}{8}})$$

Divisibility of 3: sum of digit must be divisible by 3

$$11p9q4 = \frac{23+p}{3}$$

$$= \frac{2+p}{3}\ (p = 1,\ 4,\ \underset{\text{max}}{\underset{\downarrow}{7}})$$

Hence, $pq_{(\max)} = 8 \times 7 = 56$

121. (d) Given number 780x533y24 is divisible by $88 = 8 \times 11$

Divisibility of 8: last 3 digit of no. is divisible by 8

$\Rightarrow \frac{y24}{8} \rightarrow y = 0$ (minimum)

Divisibility of 11: If the diff. between sum of odd and even place digit is 0 or multiple of 11

$\Rightarrow (7 + 0 + 5 + 3 + 2) - (8 + x + 3 + 0 + 4) = 0$ or multiple of 11

$\Rightarrow (17) - (15 + x) = 0$ or multiple of 11

$\Rightarrow x = 2$

∴ least value of $x + y = 2 + 0 = 2$

122. (c) Given, no. 3426x is divisible by 6 means it is also divisible by 3 and 2

Divisibility of 2- last digit of no. be even

$$3426x \Rightarrow \frac{3+4+2+6+x}{3} = \frac{6+x}{3}$$

$\therefore \quad x = 6$

123. (d) $620x976y52$ is divisible by 88 $= 8 \times 11$
Divisibility of 8: last 3 digit of no. is divisible by 8

$\Rightarrow \frac{y52}{8} \to y = 1$ (minimum)

Divisibility of 11: If the diff. between sum of odd and even place digit is 0 or multiple of 11
$6+0+9+6+5-(2+x+7+1+2)$
$\Rightarrow 26 - 12 - x = 11$
$\Rightarrow 14 - x = 11 \Rightarrow x = 3$
$\therefore x^2 + y^2 = 9 + 1 = 10$

124. (c) Remainder $\left(\frac{151314}{15}\right)$
$=$ Remainder $\left(\frac{150000+1305+9}{15}\right)$
Clearly, remainder = 9

125. (b) $457643x4$ is divisible by $18 \to (9 \times 2)$
The given number must be divisible by both 9 and 2
$4+5+7+6+4+3+x+4 = 33 + x$
$\therefore x = 3$

126. (d) $2x64y$, is divisible by $88 = 8 \times 11$
If any no. is divisible by 8, last three digit should be divided by 8

$2x64y = \frac{64y}{8} \Rightarrow y = 0$ or 8

Divisibility of 11: If the diff. between sum of odd and even place digit is 0 or multiple of 11
$2x648$ when $y = 8$
$2+6+8-(x+4) = 11 \Rightarrow x = 1$
$\therefore 6x - 5y = 6 \times 1 - 5 \times 8 = -34$

127. (b) **Divisibility of 4:** last two digit should be divisible by 4

So, possible value of $B = 2, \cancel{6}$

Divisibility Rule of 9: A number is divisible by 9 If sum of digit of number is divisible by 9.
$\frac{7A425B}{9} = \frac{18+A+B}{9}$
Possible value of $A = 7, \cancel{3}$
$B = 2, A = 7$ satisfy
$\therefore A - B = 7 - 2 = 5$

128. (d) Number 48ab is divisible by 2, 5 and 7
LCM of 2, 5, 7 = 70
Let, we take max. value of a and b = 9
$\frac{4899}{70} \to R = 69$
No. = 4899 − 69 = 4830
From comparison, a = 3, b = 0
$\therefore$ Required no. $= 10a - b$
$= 10 \times 3 - 0 = 30$

129. (a) 73A215 is divisible by 11
$= 73A215 = 7 + A + 1 - (3+2+5) = 0$ or multiple of 11
$\Rightarrow 8 + A - 10 = 0 \Rightarrow A = 2$
56B26 is divisible by 9
$56B26 = 19 + B \Rightarrow B = 8$
$\therefore (A + B) = (2 + 8) = 10$

130. (c) We know,
$a - 1$ is always factor of $a^n - 1$.
$49 - 1 = 48$ is factor of $49^n - 1$
$\overset{\frown}{8 \times 6}$
Thus, Required Answer is 8.

131. (a) 463y is divisible by 7.

$$\begin{array}{l} 7\overline{)\,463y\,}(66 \\ \underline{-42}\downarrow \\ \quad 43 \\ \underline{\;-42}\downarrow \\ \qquad \mathbf{14} \\ \quad \underline{-14} \\ \qquad 00 \end{array}$$

$\therefore y = 4$

132. (d) Given number $\to$ 674pq0
Divisibility of 11: If the diff. between sum of odd and even place digit is 0 or multiple of 11
$(6 + 4 + q) - (7 + p + 0) = 0$ or multiple of 11
$\Rightarrow (10 + q) - (7 + p) = 0$
From option (d) q = 2, p = 5 Satisfy
$(10 + 2) - (7 + 5) = 0$
$12 - 12 = 0$

133. (b) Divisible by $24 = 8 \times 3$
$\Rightarrow$ Divisible rule 8
$\Rightarrow$ Only option (b) divisible by 8
Hence, divisible by 24 only option (b) satisfy.

134. (c) ATQ,
$83P93678Q \div 72 \quad (72 \Rightarrow 8 \times 9)$
Thus, 78Q is divisible by $8 \Rightarrow Q = 4$
83P93678Q is divisible by 9, then
Sum of digit $= 48 + P \Rightarrow P = 6$
$\therefore \sqrt{P^2 + Q^2 + 12} = \sqrt{36 + 16 + 12} = 8$

135. (b) $K = 42 \times 25 \times 54 \times 135$
Prime factorization of
$42 = 2 \times 3 \times 7$
$25 = 5 \times 5$
$54 = 3 \times 3 \times 3 \times 2$
$135 = 3 \times 3 \times 3 \times 5$
$K = 2^2 \times 3^7 \times 5^3 \times 7 \Rightarrow 3^a = 3^7$
So, max. value of a = 7

136. (c) 678p37q is divisible by $75 \to (25 \times 3)$
Thus, 37q is divisible by $25 \Rightarrow q = 5$
Now, Divisibility by 3-
$6+7+8+p+3+7+5 = 36 + p$
$\Rightarrow p = 3.$
$\therefore p = 3, q = 5$

137. (b) 52A6B7C is divisible by $33 \to (3 \times 11)$
Using divisibility of 11-
$(5 + A + B + C) - (2 + 6 + 7) = 0$ or multiple of 11
$(A + B + C) = 10$

$$\begin{array}{ccccc} A & + & B & + & C \\ \downarrow & & \downarrow & & \downarrow \\ 3 & & 5 & & 2 = 10 \end{array}$$

For max value of $(2A + 3B + C)$
$= 2 \times 3 + 3 \times 5 + 2 = 23$

138. (d) Given Number = 647592
Rearranged Number = 245679
Here the sum of digits of rearranged number = 33
Hence, the Number will be divisible by 3

139. (b) Given Number = $72x8431y4$ is divisible by 36 $\quad (36 \to 9 \times 4)$
Divisibility of 4: last two digit must be divisible by 4
Possible value of y = 0, 2, 4, 6, 8
Divisibility of 9: sum of digit of number is divisible by 9
$72x8431y4 = 29 + x + y$
$y = \cancel{0}, 2, \cancel{4}, \cancel{6}, \cancel{8}$
Then, $x = \cancel{7}, 5, \cancel{3}, \cancel{1}, \cancel{8}$
Therefore, y = 2(smallest) and x = 5
$\therefore \frac{x}{y} - \frac{y}{x} = \frac{5}{2} - \frac{2}{5}$
$= \frac{25-4}{10} = \frac{21}{10} = 2\frac{1}{10}$

140. (b) Number = 150328
Rearranged Number = 853210
Resultant Number
$= 853210 - 5 \times 13$
$= 853210 - 65 = 853145$
Last Digit of the resultant number is 5
Hence the resultant number will b
divisible by 5

141. (c) Given, number = 34R05030M
is divisible by 16 it means that i
also divisible by 4
Possible value of M = 1, 3, 5, 7, 9
Divisibility of 11
$(3 + R + 5 + 3 + M) - (4 + 6) = 0$ o
multiple by 11
$\Rightarrow R + M + 11 - 10 = 11$
$\Rightarrow R + M = 10$
R = 9, 7, 5, 3, 1
Thus, value of R = 5, M = 5

142. (d) Number = 6336633P is divisibl
by 132
We know, $132 = 2 \times 2 \times 3 \times 11$
divisibility of 11
$\Rightarrow 6 + 3 + 6 + 3 - (3 + 6 + 3 + P)$
$= 0$ or multiple of 11
$\Rightarrow 18 - 12 - P = 0$
$\Rightarrow 6 = P$

143. (d) Let $476{*}{*}0 = 476xy0$
Sum of Digits $= 17 + x + y$
By the divisibility rule of 11
$\Rightarrow 4 + 6 + y = 7 + x + 0$
$\Rightarrow 10 + y = 7 + x$
From option (d)
y = 5 and x = 8

144. (d) Factor of $88 = 8 \times 11$
2y8 will be divisible by 8.
$\Rightarrow y = 4$
Divisibility of 11
$(9 + x + 5 + 2 + 8) - (7 + 4 + 6 + 4$
$= 0$ or multiple of 11
$\Rightarrow 24 + x - 21 = 11 \Rightarrow x = 8$
$\therefore x^2 + y^2 = 8^2 + 4^2$
$= 64 + 16 = 80$

145. (b) LCM of 2 and 7 = 14
When we divide 1000 by 14 we get 71 as quotient and 6 as remainder.
Therefore, There is 71 numbers which are divisible by both 2 and 7.

Alternate Method:
LCM of 2 and 7 = 14
14, 28........994
$N = \frac{994 - 14}{14} + 1 = 71$

146. (a) Given, 55p1067q9 is divisible by 99
$(99 \to 9 \times 11)$
Sum of digits $= 33 + p + q$ ....(i)
If the number of divisible by 9 i.e. sum will be divisible by 9.
Again, By the divisibility rule of 11.
$\Rightarrow 5 + p + 0 + 7 + 9 - (5 + 1 + 6 + q)$
$\Rightarrow 21 + p - (12 + q)$

⇒ 21 + p − 12 − q

⇒ 9 + p − q ......(ii)

Assume such values of p and q that satisfied the eqn. -(i) & eqn.-(ii) with respect to divisibility rule of 9 and 11

So, p = 7 and q = 5

∴ pq = 7 × 5 = 35

147. (d) Number = 2143251

Sum of digits = 2 + 1 + 4 + 3 + 2 + 5 + 1 = 18

18 is divisible by 3.

∴ Option (d) is correct

148. (b) Go through option.

First try to check greater no. in options.

From option we can see that option(b) and (d) is divisible by 3 but not 9.

but, 239685 > 237687

So, option (b) is correct.

149. (c) The given no. is $x8942y4$

The No. is divisible by 56. It means the number must be divisible by 7 & 8.

By the divisibility Rule of 8, 2y4 is divisible by 8.

y = 6 (largest value)

Now no. becomes $\underline{x}$ $\underline{894}$ $\underline{264}$

Now go by the divisibility rule of 7

894 − (264 + x) = 630 − x

x = 0, 7 (x = 0 is not possible)

x = 7

∴ $x^2 + y = 49 + 6 = 55$

150. (d) Given, number = $7x79251y8$ is divisible by 36 → (9 × 4)

Divisibility of 4: Last 2 digit divisible by 4.

y = 8 (largest value)

Now, the number = $7x7925188$

Divisibility of 9 = Sum of digit must be divisible by 9

⇒ (47 + x) be divisible by 9

Put x = 7

So, x = 7; y = 8

∴ $(10x^2 - 3y^2) = 10 \times (7)^2 - 3 \times (8)^2$

= 10 × 49 − 3 × 64

⇒ 490 − 192 = 298

151. (b) 9m2365n48 is divisible by 88 = 8 × 11

$\frac{n48}{8}$ → n = 2 (minimum)

Divisibility of 11

⇒ (9 + 2 + 6 + 2 + 8) − (m + 3 + 5 + 4) = 0 or multiple of 11

⇒ 27 − (m + 12) = 11

Thus, m = 4

∴ $(m^2 \times n^2) = (4^2 \times 2^2) = 16 \times 4 = 64$

152. (c) Divisible by 22 → (11 × 2)

So, b = 2, 4, 6, 8

To get the greatest number a > b

Now,

(2 + 4 + 5) − (3 + a + b) = 0 or multiple of 11

⇒ 11 − 3 − a − b = 0 or multiple of 11

⇒ 8 − a − b = 0 or multiple of 11

⇒ a + b = 8

For greatest value, b = 2, a = 6

∴ Required number = 234652.

Alternate Method:

(a) and (b) eliminated because (a) is divisible by 5 and (b) is not divisible by 2,

22 = 2 × 11

Option (c) 234652 is both divisible by 2 & 11. So 234652 is divisible by 22

153. (a) 3426k is divisible by 6 but not 5.

⇒ k ≠ 0, or 5

⇒ k should be even [divisible by 2]

Sum of all the digits we get.

3 + 4 + 2 + 6 + k = 15 + k

So, for 3426k to be divisible by 3.

k = 3, 6, 9

But k should be even

∴ k = 6

154. (a) **Divisibility of 8:** last 3 digits must be divisible by 8.

$\frac{k36}{8}$ ⇒ k = 1 (min)

k = 9 (max)

Req. sum = 1 + 9 = 10

155. (d) Given, number $273x$ is divisible by 12 → (3 × 4)

Divisibility of 4: last 2 digits must be divisible by 4.

$\frac{3x}{4} \Rightarrow x = 2, 6$

Divisibility of 3: sum of digits must be divisible by 3.

$\frac{2+7+3+x}{3} = \frac{12+x}{3}$ ∴ $x = 6$

y854z06

Divisibility of 11

(y + 5 + z + 6) − (8 + 4) = 0 or 11

(y + z + 11) − (12) = 0 or 11

y + z = 12 (max)

x + y + z = 6 + 12 = 18

156. (a) Given number 75462A97B6

Divisible by 72 → (9 × 8)

Divisibility of 8: last 3 digit must be divisible by 8.

$= \frac{7B6}{8} \Rightarrow B = 3, 7$

Divisibility of 9 → sum of digits must be divisible by 9.

$\frac{7+5+4+6+2+A+9+7+B+6}{9}$

$= \frac{46+A+B}{9}$

$B = 3, \cancel{7}, \quad A = 5, \cancel{1}$

$\therefore \sqrt{8A-4B} = \sqrt{8\times5-4\times3} = \sqrt{28}$

157. (a) Given number $789x6378y$ is divisible by 72 → (9 × 8)

Divisibility of 8: last 3 digit must be divisible by 8.

$\frac{78y}{8} \Rightarrow y = 4$

Divisibility of 9: sum of digits must be divisible by 9.

$\frac{7+8+9+x+6+3+7+8+y}{9}$

$= \frac{48+x+y}{9} \Rightarrow x = 2, y = 4$

∴ $x \times y = 2 \times 4 = 8$

158. (c) The given 5-digit no $676xy$ is divided by 3, 7, 11

then, It will also divisible by (3 × 7 × 11 = 231)

By taking the largest 5-digit no = 67699

$\frac{67699}{231}$ → R=16

So, required no = 67699 − 16= 67683

⇒ x = 8, y = 3

∴ $(3x - 5y) = 24 - 15 = 9$

159. (d) The no $5x423y$ is divisible by 88 (88 → 8 × 11)

Divisibility of 8: last 3 digit must be divisible by 8.

$\frac{23y}{8} \Rightarrow y = 2$

Divisibility of 11:

(5 + 4 + 3) − (x + 2 + 2) = 0 or multiple of 11

12 − (4 + x) = 0

8 − x = 0 ⇒ x = 8

∴ $(5x - 8y) = 40 - 16 = 24$

160. (a) The no 7p5964q28 is divisible by 88 → (8 × 11)

Divisibility of 8: last 3 digit must be divisible by 8.

$\frac{q28}{8}$ ⇒ q = 9 (largest value)

Divisibility of 11:

(7 + 5 + 6 + 9 + 8) − (p + 9 + 4 + 2) = 0 or multiple of 11

⇒ 35 − p − 15 = 11 ⇒ p = 9

∴ $p^2 - q = 81 - 9 = 72$

161. (c) Given number $94x29y6$ is divisible by 72 = 9 × 8

Divisibility of 8:- last 3 digit must be divisible by 8.

$\frac{9y6}{8} \Rightarrow y = 3, 7$

Divisibility of 9:- sum of digits must be divisible by 9.

$\frac{9+4+x+2+9+y+6}{9} = \frac{30+x+y}{9}$

$y = \cancel{3}, 7 \quad (x \neq y)$

$x = \cancel{3}, 8$

∴ $2x + 3y = 2 \times 8 + 3 \times 7 = 37$

162. (a) 45082k is divisible by 3

Digit sum = (4 + 5 + 0 + 8 + 2 + k = 19 + k) divisible by 3

Then, Greatest value of k = 8

& Smallest value of k = 2

Required no. = $8^2 + 2^2 = 64 + 4 = 68$

163. (c) $888x53y4$ is divisible by 72 → (8 × 9)

Divisibility of 8: last 3 digit must be divisible by 8.

$\frac{3y4}{8} \Rightarrow y = 0, 4, 8$

Divisibility of 9 → sum of digits must be divisible by 9.

$\frac{8+8+8+x+5+3+y+4}{9} = \frac{36+x+y}{9}$

For greatest value of y

y = 8, x = 1

∴ 7x + 2y = 7 × 1 + 2 × 8 = 23

164. (a) Let, P = div. by 2, Q = div. by 3

∴ P × Q is divisible by 6 → (2 × 3)

165. (c) 823p2q is exactly divisible by 7, 11, 13

We know, ABCABC is divisible by (7 × 11 × 13 = 1001)

So, p = 8 q = 3

∴ p − q = 8 − 3 = 5

166. (b) $7698x138y$ is divisible by 72 → (9 × 8)

Divisibility of 8: last 3 digit must be divisible by 8

$\frac{38y}{8} \Rightarrow y = 4$

Divisibility of 9: sum of digits must be divisible by 9

$7 + 6 + 9 + 8 + x + 1 + 3 + 8 + 4$

$= 46 + x \Rightarrow x = 8$

$\therefore \sqrt{4x+y} = \sqrt{32+4} = 6$

167. (a) n = 475AB

Since, n is divisible by 5

B = 0, B ≠ 5 (∴ Number is divisible by 8)

Now, 5A0 is divisible by 8

⇒ A = 2, 6

But if A = 6, it is not divisible by 9

Hence, A = 2, B = 0

∴ 10A + B = 20

168. (a) The given 5-digit no 672xy is divided by 3, 7, 11

then, It will also divisible by (3 × 7 × 11 = 231)

By taking the largest 5-digit no = 67299

$\frac{67299}{231} \rightarrow R = 78$

So, required no = 67299 – 78 = 67221

So, $x = 2$, $y = 1$

∴ $(6x + 5y) = 6 \times 2 + 5 \times 1 = 17$

169. (d) The given 5-digit no 457ab is divided by 3, 7, 11

then, It will also divisible by (3 × 7 × 11 = 231)

By taking the largest 5-digit no = 45799

$\frac{45799}{231} \rightarrow R = 61$

So, required no. = 45799 – 61
= 45738

So, $x = 3$, $y = 8$

$\therefore a^2 + b^2 - ab = 9 + 64 - 24$

$= 73 - 24 = 49$

170. (b) Since, 15x1y2 is divisible by 44 (4 × 11)

Divisibility of 11: The difference between the sum of the digits in the odd places and the sum of the digits in the even places must be zero or multiple of 11.

15x1y2

$(1 + x + y) - (5 + 1 + 2) = 0$

$\Rightarrow x + y + 1 - 8 = 0$

$\therefore x + y = 7$

171. (b) 8439x53 is divisible by 99 → (11 × 9)

$\frac{8439x53}{99} \Rightarrow 99 = 11 \times 9$

Divisibility rule for 9 → sum of digits must be divisible by 9.

$= \frac{8+4+3+9+x+5+3}{9} = \frac{32+x}{9}$

$\Rightarrow x = 4$

No need to check multiply of 11 for required value $x = 4$

172. (a) 23_45678 is divisible by 22 → (2 × 11)

divisibility rule of 11

$\Rightarrow (2 + \underline{x} + 5 + 7) - (3 + 4 + 6 + 8)$

= 0 or multiple of 11

$\Rightarrow 14 + x - 21 = 0 \Rightarrow x = 7$

173. (c) 6 = 2 × 3

For the divisibility of 2:- unit digit should be 0, 2, 4, 6, 8

option (b) and (d) eliminated from above rule.

For the divisibility of 3:- sum of digits should be divisible by 3.

128530 = 19 (not divisible by 3)

438750 = 27 (divisible by 3)

∴ 438750 is divisible by 6.

174. (d)

```
45)7658(17
   45
   315
   315
     8
```

∴ Numbers = 7658 – 8 = 7650

Alternate Method:

Just check the multiple of 9 only option (d) satisfied (45 = 9 × 5).

175. (c) $\frac{7918378}{13} \Rightarrow R = 0$

Note: Solve by eliminating options to check divisibility of 9, 4 & 11

176. (b) No.→1254216 is divisible by 8

Now, last three digit divisible by 8.

$\frac{216}{8} \rightarrow R_{em} = 0$

Hence, the given no. is divisible by 8.

177. (d) If the last two digits of a number are zeroes or the number formed by the last digits is a multiple of 25, then the number is divisible by 25.

Hence 10000 is divisible by 25.

178. (d) **Divisibility rule of 11:** Odd place – Even place = 0 or Multiple of 11

2 9 1 8 2 4 5

Now, 21 – 10 = 11

Hence, the given number is divisible by 11.

179. (b) A number is divisible by 6 only when n is divisible by 2 and 3

Solving we get the options 800552 is not divisible by 6. Because it is not divisible by 3.

180. (c) Given no = 13051

For divisibility of 9 sum of digit must be divisible by 9.

⇒ 1 + 3 + 0 + 5 + 1 = 10

We have to add 8 in this so that number is divisible by 9.

So, required no. = 13051 + 8 = 13059

181. (d) Now, we check through options

(a) 324781 → 3 + 2 + 4 + 7 + 8 + 1 = 25

(b) 329787 → 3 + 2 + 9 + 7 + 8 + 7

= 36 < Div. by 9, Div. by 3

(c) 326787 → 3 + 2 + 6 + 7 + 8 + 7 = 33 → div. by 3

(d) 329784 → 3 + 2 + 9 + 7 + 8 + 4 = 33 → div. by 3

Now, here we see option (c) & (d) is divisible by 3

But option (d) is greatest value.

182. (a) Given, no. = 76050

Divisibility of 4: last two digit of the number should be divisible by 4

$\Rightarrow \frac{50}{4} \rightarrow R = 2$

Hence, given number is not divisible by 4

Option (a) is correct

183. (a) Solve by options:

Divisibility of 24: Divisibility of 8 and 3.

Divisibility of 8: last 3 digit of number is divided by 8

$\frac{35751}{8} \Rightarrow \frac{751}{8} \rightarrow R = 7$

Hence, 35751 is not divisible by 24.

184. (d) We can write, 132 = 11 × 4 × 3

Now, On checking with the help of divisibility rule of 3, 4 and 11. we find that numbers divisible by 132 are 660, 924, 1980, 1452.

Thus, Required answer = 4

185. (b) 24 = 3 × 8

Divisibility of 3: A number is divisible by 3 If sum of digit of number is divisible by 3.

Divisibility of 8: A number is divisible by 8 if last 3 digit of the number is divisible by 8.

Now, We can see that only option(b) i.e. 49512 is divisible by 8 and 3.

186. (b) **Divisibility of 7:** First we make pair of 3 digit number from right side and then subtract the sum of alternate pair. If resultant is divisible by 7 then initial number must be divisible by 7.

$\Rightarrow \underline{024}\ \underline{963} = 963 - 24 = 939$

$\frac{939}{7} \rightarrow R = 1$

$\Rightarrow \underline{024}\ \underline{973} = 973 - 24 = 949$

$\frac{949}{7} \rightarrow R = 4$

$\Rightarrow \underline{024}\ \underline{983} = 983 - 24 = 959$

$\frac{959}{7} \rightarrow R = 0$

$\Rightarrow \underline{024}\ \underline{993} = 993 - 24 = 969$

$\frac{969}{7} \rightarrow R = 3$

So, option (b) 24983 is divisible by 7

187. (d) 36 = 4 × 9

Option (a), (b) & (c) is eliminated since these are not divisible by 9.

Thus, Required Answer is (d).

188. (a) We know, 33 = 3 × 11

Thus, If a number is divisible by 3 then that number will also be divisible by 3 & 11.

In the given number only 35508 is divisible by 3 and 11.

189. (c) Given, no.

10373 + 24871 = 35244

$\frac{35244}{3} \rightarrow R = 0 \Rightarrow \frac{35244}{2} \rightarrow R = 0$

Hence, given no. is divisible by 3, 2, means no. is also divisible by 6.

190. (b) Given, no. 974581297426,

(9 + 4 + 8 + 2 + 7 + 2) – (7 + 5 + 1 + 9 + 4 + 6) = 32 – 32 = 0

The given number is clearly divisible by 11.

191. (c) Three digit no. which is divided by 15 = 105, 120, 135, ..., 990

First term (a) = 105

Last term (l) = 990

Diff. (d) = 120 – 105 = 15

Number of terms (n) = $\frac{l-a}{d}+1$

$n = \frac{990-105}{15}+1 = 60$

Now, $S_n = \frac{n}{2}(a+l)$

$= \frac{60}{2}(105+990) = 32850$

192. (c) Since last three digits of the given number is divisible by 8.
So, number 1254216 is divisible by 8.

193. (d) $m - 2 = 0$
$\Rightarrow m = 2$
$\therefore f(m) = m^5 + 5m^4 - 3m + 7$
$f(2) = 2^5 + 5 \times 2^4 - 3 \times 2 + 7$
$= 32 + 80 - 6 + 7$
$= 119 - 6 = 113$
Hence remainder is 113

194. (b) $2^{2n} + 2n$ is divisible by 6.
From option: put n = 1 (lowest value)
$2^2 + 2 = 6 \Rightarrow$ divisible by 6.

195. (a) m is even
So, let, m = 2
$\Rightarrow 8^m - 1 = 8^2 - 1$
$\Rightarrow 64 - 1 = 63$
$\therefore 8^m - 1$ is divisible by 63.

Alternate Method:

$\because$ m is even
So, $(8^m - 1)$ is divisible by $(8-1)$ & $(8+1)$

7 & 9

$\therefore$ LCM = 63

It is divisibly by 63

196. (a) $k^{33} - k = k(k^{32} - 1)$
$= k(k^{16}+1)(k^{16}-1)$
$= k(k^{16}+1)(k^8+1)(k^8-1)$
$= k(k^{16}+1)(k^8+1)(k^4+1)(k^4-1)$
$= k(k^{16}+1)(k^8+1)(k^4+1)(k^2+1)(k^2-1)$
$= k(k+1)(k-1)(k^2+1)(k^4+1)(k^8+1)(k^{16}+1)$
k being an odd number greater than 1.
Let k = 3
$3 \times 4 \times 2 = 24$
$\therefore k^{33} - k$ is always divisible by 24.

197. (c) $\frac{m}{7} \rightarrow R = 5$

$\Rightarrow R \rightarrow \frac{3 \times 5}{7} = 1$

198. (a) $7^{15} + 7^{16} + 7^{17}$
$= 7^{15}(1 + 7 + 7^2) = 7^{15}(57)$
$= 7^{15} \times 3 \times 19$
$\therefore$ From options, it is divisible by 3.

199. (c) $6^{25} + 6^{26} + 6^{27} + 6^{28}$
$= 6^{25}(1 + 6 + 6^2 + 6^3)$
$= 6^{25}(1 + 6 + 36 + 216) = 6^{25} \times 259$
So, it is divisible by 259

200. (b) $4^{12}(1 + 4 + 4^2 + 4^3)$
$= 4^{12}(1 + 4 + 16 + 64)$
$= 4^{12}(85) = 4^{12} \times 85$
= 85 is divisible by 17
So Number is divisible by 17

201. (d) $4^{12} + 4^{13} + 4^{14} + 4^{15}$
$= 4^{12}(4^0 + 4^1 + 4^2 + 4^3) = 4^{12} \times 85$
Since 85 is divisible by 17.
Thus, Given expression will also be divisible by 17.

202. (c) $(6^{61} + 6^{62} + 6^{63} + 6^{64})$
$= 6^{61}(6^0 + 6 + 6^2 + 6^3)$
$= 6^{61}(1 + 6 + 36 + 216) = 6^{61}(259)$
Here by checking all the options, 259 is divisible by 7.
So, the given number will be divisible by 7.

203. (a) $3^{50} + 9^{26} + 9^{27} + 9^{28} + 9^{29}$
$= 9^{25} + 9^{26} + 9^{27} + 9^{28} + 9^{29}$
$= 9^{25}[9^0 + 9 + 9^2 + 9^3 + 9^4]$
$= 9^{25}[1 + 9 + 81 + 729 + 6561]$
$= 9^{25} \times 7381 = 9^{25} \times 671 \times 11$
$\Rightarrow$ divisible by 11

204. (a) $5^{71} + 5^{72} + 5^{73} + 5^{74} + 5^{75}$
$= 5^{71}(5^0 + 5 + 5^2 + 5^3 + 5^4)$
$= 5^{71}(781) = 5^{71} \times 11 \times 71$
Hence, number will be divisible by 71

205. (c) Given,
$f(x) = x^3 - 4x^2 - 8x + 11$
if divisible by $(x+2)$
Then, $f(-2) = 0$
$\Rightarrow f(-2) = -8 - 16 + 16 + 11 = 3$
$\therefore$ '3' must be subtracted

Alternate Method:

$$\begin{array}{r l}
 & x^2 - 6x + 4 \\
x+2 \,\big)\!\! & \overline{x^3 - 4x^2 - 8x + 11} \\
 & \underline{\overset{-}{x^3} + \overset{-}{2x^2}} \\
 & -6x^2 - 8x + 11 \\
 & \underline{\overset{+}{-}6x^2 \overset{+}{-} 12x} \\
 & 4x + 11 \\
 & \underline{\overset{-}{4x} + \overset{-}{8}} \\
 & 3 \longrightarrow \text{Remainder}
\end{array}$$

Hence, '3' must be subtracted

206. (a) $17^3 + 18^3 - 16^3 - 15^3$
$= (17^3 + 18^3) - (16^3 + 15^3)$
$a^n + b^n$ is divisible by a + b if n is odd
$\Rightarrow 35 - 31 = 4 = 2 \times 2$
So, it is exactly divisible by 2.

207. (c) That number is divisible by 2, 5
It means last digit of number must be 0 thus we take, option (a), (c)
Divisibility of 3 → Sum of digit of number must be divisible by 3
from option (c)

$2345760 = \frac{2+3+4+5+7+6+0}{3}$

$\therefore R = 0$
So, required answer is (c)

208. (c) 312, 936, 1872 and 7176 are divisible by 156

$\frac{312}{156} = 2; \frac{936}{156} = 6;$

$\frac{1872}{156} = 12; \frac{7176}{156} = 46$

Hence Required Answer = 4

209. (d) 6-digit number having consecutive digits will always be divisible by '3'.
Ex:- 123456 is divisible by 3.

210. (a) Prime factor of 198 = 3 × 6 × 11
Hence, Any number is divisible by 198 if the number is divisible by 3, 6 and 11.
If we rearrange the digit of the number the divisibility rule of 6 and 11 will hamper; but the divisibility rule of 3 is based on the sum of digits which will not change.
Hence, The new Number is divisible by 3.

211. (c) $\frac{999999}{52} \rightarrow R = 39$
Number = 999999 − 39
= 999960

212. (b) Let the number is *xyzxyz*.
$\therefore 100000x + 10000y + 1000z + 100x + 10y + z$
$= 100100x + 10010y + 1001z$
$= 1001(100x + 10y + z)$
Therefore, No. is divisible by 1001

Alternate Method:

When a six digit number is formed by repeating a 3 digit number like *xyz* is written as *xyzxyz* then it is always divisible by 7, 11, 13 & (LCM of 7, 11, 13) = 1001

213. (b) Number that are divisible by 9 between 43 and 481 = 45, 54 … 477

$N = \frac{477-45}{9} + 1 = 49$

214. (c) LCM of (5, 6, 7) = 210
I – 210 × 1 = 210
II – 210 × 2 = 420
III – 210 × 3 = 630
Between 400 and 700
420 and 630
$\therefore$ Required no. = 2

215. (b) LCM of (2, 3 and 4) = 12
No. which is divisible by 12 = 12, 24, 36, 48, 60.
$\therefore$ There are 5 numbers which are divisible by 2, 3 and 4.

Alternate Method:

LCM of (2, 3 and 4) = 12
No. which is divisible by 12 between

10 to 65 = $\frac{65}{12}$ = 5.

216. (d) Divisibility rule of 8 = Last three digit of any no. divisible by 8.
So,
2000 2008 2016 2020

$2008 \Rightarrow \frac{008}{8} \rightarrow R = 0$

$2016 \Rightarrow \frac{016}{8} \rightarrow R = 0$

Hence, There are two number which are divisible by 8.

217. (b) Since the given number 'abba' is divisible by 4. So value of 'a' must be 2, 4, 6 & 8. (0 not possible)

a	b
2 →	(3,5,7,9) = 32,52,72,92 = 4
4 →	(6,8) = 64,84 = 2
6 →	(7,9) = 76,96 = 2
8 →	0

Total possible no. = (4 + 2 + 2) = 8

218. (d) ATQ,
Number that are divisible by 10 between 501 and 701
= 510, 520, ……… 700

$N = \frac{700-510}{10} + 1 = 20$

We subtract those that are also divisible by 3 and 10 = (30)
510, 540 ….. 690

$N = \frac{690-510}{30} + 1 = 7$

∴ Number which are divisible by 10 but not 3 = 20 − 7 = 13

219. (a) Numbers which are divisible by 5 = 205, 210 400

$n = \frac{400-205}{5} + 1 = 40$

Numbers which are divisible by 4 and 5

$n = \frac{400-220}{20} + 1 = 10$

Numbers which are divisible by 5 but not by 4 = (40 − 10) = 30

220. (c) Total two digit no. divisible by 5

$= \frac{99}{5} - 1 = 19 - 1 = 18$

(5 is not include)

Total 2-digit no. divisible by 3 are

$\frac{99}{3} - 3 = 30$ (3, 6 & 9 is not include)

Now, among these no.

15, 30, 45, 60, 75, 90 → are divisible by both 3 and 5.

∴ Total number = 30 + 18 − 6 = 42.

221. (c) (I) Total number included 500 and 650 = 650 − 500 + 1 = 151

Total number divisible by 3

$= \frac{151}{3} \rightarrow (50)$

Total number divisible by 7

$= \frac{151}{7} \rightarrow (21)$

Total number divisible by (3 × 7)

$= \frac{151}{21} \rightarrow (7)$

Required Numbers = 151 − (50 + 21 − 7) = 87

222. (d) Find number which are divisible by 5 and 7.

Divisible by 5 = $\frac{800-200}{5} + 1 = 121$

Divisible by 7 = $\frac{798-203}{7} + 1 = 86$

Divisible by both 5 and 7 or (35)

$= \frac{770-210}{35} + 1 = 17$

Divisible by 5 or 7 = 121 + 86 − 17 = 190

∴ Required no = 601 − 190 = 411

223. (c) LCM of 5, 6, 8 = 120

Number between = 300 − 700

I − 120 × 3 = 360

II − 120 × 4 = 480

III − 120 × 5 = 600

Required no. = 3

224. (a) Sum of first 12 natural number

$= \frac{n(n+1)}{2} = \frac{12\times13}{2} = 78$

By option (a)

$\frac{78}{6} \rightarrow R=0$

Hence, the number = 6

225. (b) Three digit no. that is divisible by 20 = 100, 120 980

$n = \frac{980-100}{20} + 1$

$= \frac{880}{20} + 1 = 44 + 1 = 45$

$S_n = \frac{n}{2}(a + l)$

$S_n = \frac{45}{2}(100 + 980)$

$S_n = \frac{45}{2} \times 1080 = 45 \times 540 = 24300$

226. (c) First three digit number which is divided by 20 = 100

Last three digit number which is divided by 20 = 980

Series = 100 + 120 + 140 +....+ 980

= 20 [5 + 6 + 7 + ... + 49]

$= 20\left[\frac{45}{2}(5+49)\right]$

= 20 [45 × 27] = 24300

227. (c) Two digit number which are divisible by 9 = 18, 27 99

$N = \frac{99-18}{9} + 1 = 10$

$S_N = \frac{10}{2}(18 + 99) = 585$

228. (c) abc, cab, bca are given numbers

let no. abc = 123

312 = cab, 231 = bca

Sum = 666

From options sum is not divisible by 31

229. (d) Let, the number is x.

ATQ,

$\frac{x}{55} = 28$ remainder

∵ 55 is divisible by 11.

∴ When divides same number by 11,

remainder = $\frac{28}{11} = 6$

230. (c) N = 363a + 17 = 11 (33a + 1) + 6

∴ Remainder = 6

231. (a) Let, number = x

ATQ, $\frac{x}{304} = 43 \rightarrow$ Remainder,

Then, $\frac{43}{16} = 11 \rightarrow$ Remainder.

232. (c) Number = 459 × 1 + 19 = 478

Now, $\frac{478}{17} = 2$ Remainder.

Alternate Method:

The remainder of the given condition divided by 17

$\frac{R}{17} = \frac{19}{17} = 2$ Remainder.

233. (d) Number = 512 × 1 + 67

= 579

Remainder = $\frac{579}{32} = 3$.

Alternate Method:

Divide the remainder of the first number by 32.

$\frac{67}{32} = 3 \rightarrow$ Remainder.

234. (a) n = 5 × 1 + 3 = 8

6n = 6 × 8 = 48

When 48 is divided by 5,

∴ Remainder = 3

235. (c) Dividend = Divisor × Quotient + remainder

∴ N = 78 × 280 + 0

Now, $\frac{78\times280}{65} \rightarrow R = 0$

236. (a) ATQ,

N = 45D + 21

When the no. is divided by 15

Remainder = $\frac{45D+21}{15}$

$= \frac{45D}{15} + \frac{21}{15} = \frac{21}{15} \rightarrow R = 6$

237. (d) Let the number is x

$\frac{x}{7} \rightarrow R = 4 \Rightarrow x = 7 + 4 = 11$

$\frac{11^2}{7} \rightarrow R = 2$

Alternate Method:

In this types of question, we will square the remainder and divided by given number

$\Rightarrow \frac{(4)^2}{7} \rightarrow R = 2$

238. (b) Quotient × 10 = Remainder × 4

⇒ Quotient × 10 = 45 × 4

⇒ Quotient = 18

Dividend = divisor × Quotient + Remainder

= 180 × 18 + 45 = 3285

239. (c) N = 7x + 3 .....(i)

⇒ 7x = N − 3

⇒ N − 3 is a multiple of 7

But N − 3 is not in option

So, next number divisible by 7 is (N − 3) + 7 = N + 4.

240. (c) Let, the no. is 8

$\frac{8}{7} \rightarrow R = 1$

$\Rightarrow \frac{8^3}{7} = \frac{512}{7} = 1$

Alternate Method:

We can directly solve this by given remainder

R = 1

$\Rightarrow \frac{N}{7} \rightarrow R = 1 \Rightarrow \frac{(1)^3}{7} \rightarrow R = 1.$

241. (d) A.T.Q.

Divisor = 10 × Q = 5 × R

10 × Q = 5 × 46

⇒ Q = 23

Divisor = 23 × 10 = 230

Dividend = Divisor × Quotient + Remainder

= 230 × 23 + 46 = 5290 + 46 = 5336

242. (a) Divisor (D) = 4 × Q = 2 × R, R = 32

⇒ 4 × Q = 2 × 32

⇒ Q = 16

Divisor (D) = 4 × 16 = 64

We know,

∴ Dividend = D × Q + R

= 64 × 16 + 32 = 1024 + 32 = 1056

243. (c) ATQ,

Remainder = 39, Divisor = 39 × 6,

Quotient = $\frac{39\times6}{13} = 18$

Dividend = Divisor × Quotient + Remainder

= 39 × 6 × 18 + 39

= 4251 (Unit digit = 1)

By unit digit option (c) is correct

244. (d) Remainder = 12, Divisor = 5 times the remainder = 60, Quotient

$= \frac{1}{10}$ of divisor = 6

Dividend = Divisor × Quotient + Remainder
Dividend = 60 × 6 + 12
= 360 + 12 = 372

245. (d) Given, Divisor = 11 × Q = 5 × R
ATQ, 11 × Q = 5 × 44
⇒ Q = 5 × 4 = 20
Dividend = (5 × 44) × 20 + 44
= 220 × 20 + 44 = 4444

246. (b) Let the divisor be x.
⇒ $8675123 = 33611x + 3485$
⇒ $x = 258$

247. (c) Remainder is 8 it means the divisor must be greater than 8.
200 = 192 + 8
192 must be completely divisibly by x.
$\because 192 = 2^6 \times 3^1$
Total factors = (6 + 1)(1 + 1) = 14
Factors till 8 = 1, 2, 3, 4, 6, 8 = 6 will not be considered.
∴ Required factors = 14 – 6 = 8

248. (b) Remainder is 12 it means divisor must be greater than 12.
732 = 720 + 12
$\because$ 720 must be divisible by x .
$720 = 2^4 \times 3^2 \times 5^1$
Total factors of 720
= (4 + 1) × (2 + 1) × (1 + 1) = 30
Factors till 12
= 1, 2, 3, 4, 5, 6, 8, 9, 10, 12 = 10
∴ Required factor = 30 – 10 = 20

249. (d) When n is divided by 18, quotient, is x and remainder is 6.
⇒ $n = 18x + 6$ ......(i)
When n is divided by 25, quotient is y and remainder is 15.
⇒ $n = 25y + 15$ ......(ii)
from (i) and (ii),
$18x + 6 = 25y + 15 \Rightarrow 18x - 25y = 9$

250. (d) Let the two number be x and y.
$x - y = 1564$ ......(i)
$x = y \times 6 + 19$ .....(ii)
From (i) & (ii),
⇒ 6y – y = 1564 – 19
⇒ 5y = 1545 ⇒ y = 309

251. (d) Dividend = Divisor × Quotient + Remainder
ATQ,
Divisor = $\frac{18935-65}{102} = 185$

252. (b) Number = 732 – 12 = 720
720 must be exactly divisible by n.
Factors of 720 = $2^4 \times 3^2 \times 5$
Total number of factors
= 5 × 3 × 2 = 30
Factors below 12 = 1, 2, 3, 4, 5, 6, 8, 9, 10, 12
∴ Total no. of possible value of n
= 30 – 10 = 20

253. (d) Given,
$\frac{N_1}{d} \to R_1 = 57$
$\Rightarrow \frac{N_2}{d} \to R_2 = 57$
Now, $\frac{N_1 + N_2}{d} \to R_3 = 49$
$\therefore d = R_1 + R_2 - R_3$
= 57 + 57 – 49 = 65

254. (b) Let the greater number be x and smaller number y
ATQ,
$x - y = 1280$ ....(i)
$x = 7y + 50$ ....(ii)
7y + 50 – y = 1280
⇒ 6y = 1230
⇒ y = 205
∴ $x = y + 1280 = 1485$

255. (b) Rem.→ +9 +2 +3
$$\frac{\overset{\uparrow}{179} \times \overset{\uparrow}{172} \times \overset{\uparrow}{173}}{17}$$
Remainder, when given product is divided by 17 = $\frac{(9\times2\times3)}{17} = \frac{54}{17}$
$= \frac{3}{17}$ ⟶ Remainder

256. (d) (+10) (+10) (+8)
$$\frac{335\times608\times853}{13}$$
$= \frac{10\times10\times8}{13} = \frac{800}{13} \to R = 7$

257. (b) +2 +3 +8 +6
Remainder = $\frac{72}{35} \times \frac{73}{35} \times \frac{78}{35} \times \frac{76}{35}$
$= \frac{2\times3\times8\times6}{35} = \frac{288}{35}$
∴ Remainder = 8

258. (d) Remainder
$= \left(\frac{1433}{12}\right)\left(\frac{1433}{12}\right)\left(\frac{1422}{12}\right)\left(\frac{1425}{12}\right)$
$= \frac{5\times5\times6\times9}{12} = \frac{1350}{12}$
∴ Remainder = 6

259. (b) 75 × 73 × 78 × 76 is divided by 34.
$= \frac{(75\times73\times78\times76)}{34}$
$= \left(\frac{75}{34}\right)\times\left(\frac{73}{34}\right)\times\left(\frac{78}{34}\right)\times\left(\frac{76}{34}\right)$
= 7 × 5 × 10 × 8
$= \left(\frac{35\times80}{34}\right) = \left(\frac{35}{34}\right)\times\left(\frac{80}{34}\right)$
= 1 × 12 = 12
∴ The remainder is 12.

260. (b) Remainder
+3 +3 +2 +5
$= \frac{1433\times1433\times1422\times1425}{10}$
$= \frac{3\times3\times2\times5}{10} \to R = 0$

261. (a) $\frac{77^{77}+77}{78} = \frac{(78-1)^{77}+(78-1)}{78}$
$= \frac{-1^{77}+(-1)}{78} = \frac{-1-1}{78} = \frac{-2}{78}$
∴ R = 78 – 2 = 76

262. (c) $\frac{17^{13}-21}{18} = \frac{(-1)^{13}-21}{18}$
$= \frac{-22}{18} = \frac{-4}{18} = -4 + 18 = 14$

263. (b) $\frac{8^6+1}{7} = \frac{8^6}{7} + \frac{1}{7} = (+1)^6 + (1)$
= 1 + 1 = 2 Remainder

264. (d) Remainder = $\frac{27^{27}+27}{28}$
⇒ $(-1)^{27} + (-1) = -2$
Keep in mind, To get remainder in positive integer, add divisor in negative remainder
Thus, required remainder
= 28 – 2 = 26

265. (b) $\frac{9^{20}+2}{4} = \frac{(9)^{20}}{4} + \frac{2}{4}$
$= \frac{(1)^{20}}{4} + \frac{2}{4} = \frac{1}{4} + \frac{2}{4}$
$= \frac{3}{4} \Rightarrow R = 3$

266. (a) Using concept of remainder theorem,
$= \frac{(265)^{4081}+9}{266}$
∴Required remainder = $\frac{(-1)^{4081}+9}{266} = 8$

267. (c) $\frac{19^{200}}{20} \Rightarrow \frac{(20-1)^{200}}{20} = \frac{(-1)^{200}}{20}$
= 1 (Remainder)

268. (d) $\frac{2^{256}}{17} = \frac{(2^4)^{64}}{17} = \frac{16^{64}}{17} = (-1)^{64} = 1$

269. (c) Remainder = $\left(\frac{4^{999}}{7}\right) = \frac{(4^3)^{333}}{7}$
$= \left(\frac{64^{333}}{7}\right) = \frac{(1)^{333}}{7} \to R = 1$

270. (c) Remainder
$= \frac{7^{42}}{48} = \frac{(7^2)^{21}}{48} = \frac{(49)^{21}}{48} = 1$

271. (a) Remainder = $\frac{19^{19}+20}{18}$
$= \frac{(1)^{19}+2}{18} = 1 + 2 = 3$

272. (c) ATQ,
$\frac{2^{24}-1}{7} = \frac{(2^3)^8-1}{7} = \frac{8^8-1}{7} = \frac{1-1}{7}$
⇒ R = 0

273. (b) $\frac{5^{70}+7^{70}}{74} = \frac{(5^2)^{35}+(7^2)^{35}}{74}$
$= \frac{(25)^{35}+(49)^{35}}{74}$
$a^n + b^n$ is always divisible by (a + b) when 'n' is odd number.
25 + 49 = 74
∴ Remainder = 0

274. (d) $9 + 9^2 + \ldots\ldots\ldots\ldots\ldots + 9^{(2n+1)}$,
Let, n = 1
$\Rightarrow \frac{9+9^2+9^3}{6} = \frac{3+3+3}{6}$
∴ Remainder = 3

275. (c) Concept- $x^n + y^n$ will always be divisible by $(x + y)$ if n is odd.
Thus, $x^{17} + 1$ is completely divisible by $(x + 1)$.
∴ Remainder = 0

Alternate Method:
$x + 1 = 0 \Rightarrow x = -1$
$x^{17} + 1 = (-1)^{17} + 1 = -1 + 1 = 0$
Hence, remainder = 0

276. (d) We can write, $5^{16} = (6 - 1)^{16}$
$R_1 = \frac{(5^{16})}{6} = \frac{(6-1)^{16}}{6} \to R_1 = 1$
Again,
$R_2 = \frac{5^{25}}{6} = \frac{(6-1)^{25}}{6} = \frac{-1}{6} \to R_2 = 5$
$\therefore \frac{R_1+R_2}{R_2} = \frac{1+5}{5} = \frac{6}{5}$

277. (b) $\frac{x}{31} \rightarrow R = 17$

$\frac{y}{31} \rightarrow R = 24$

$\frac{z}{31} \rightarrow R = 27$

Then, $\frac{4x - 2y + 3z}{31}$

$= \frac{4 \times 17 - 2 \times 24 + 3 \times 27}{31}$

$= \frac{68 - 48 + 81}{31} = \frac{101}{31} \rightarrow R = 8$

278. (a) 654321 × 123456
Last digit = 1 × 6 = 6
Option (a) is correct answer

279. (d) If the equation divided by $(x - 2)$ it means $x = 2$
Put $x = 2$
$f(x) \Rightarrow 2x^3 + ax^2 + 3x - 5 = x^3 + x^2 - 2x + a$
$f(2) \Rightarrow 16 + 4a + 6 - 5 = 8 + 4 - 4 + a$
$\Rightarrow 17 + 4a = 8 + a$
$\Rightarrow 3a = -9 \Rightarrow a = -3$
Now put $a = -3$ and $x = 2$
$2x^3 + ax^2 + 3x - 5 = 2 \times 2^3 - 3 \times 2^2 + 3 \times 2 - 5$
$= 2 \times 8 - 12 + 6 - 5$
$= 16 - 12 + 1 = 5$
$\therefore$ Remainder = 5

Alternate Method:

If the equation divided by $(x - 2)$ it means $x = 2$
Put $x = 2$
$2x^3 + ax^2 + 3x - 5 = x^3 + x^2 - 2x + a$
$\Rightarrow 16 + 4a + 6 - 5 = 8 + 4 - 4 + a$
$\Rightarrow 17 + 4a = 8 + a$
$\Rightarrow 3a = -9 \Rightarrow a = -3$
Now, put $a = -3$

$x-2\overline{)2x^3-3x^2+3x-5}(2x^2+x+5$
$\underset{-}{2x^3}\underset{+}{-4x^2}$
x^2+3x
$\underset{-}{x^2}\underset{+}{-2x}$
$5x-5$
$\underset{-}{5x}\underset{+}{-10}$
Rem.$\rightarrow$5

280. (a) If the eq. is divided by $(x - 5)$ it means $x = 5$
satisfied that eq.
$P(x) = x^3 - 3x^2 + 4x - 75$
Put $x = 5$
$f(5) = (5)^3 - 3(5)^2 + 4 \times 5 - 75$
$= 125 - 75 + 20 - 75 = -5$
For satisfying equation we should add 5 i.e., $(-5 + 5) = 0$

Alternate Method:

$x^2 + 2x + 14$
$x - 5\overline{)x^3 - 3x^2 + 4x - 75}$
$\underset{-}{x^3}\underset{+}{-5x^2}$
$2x^2 + 4x$
$\underset{-}{2x^2}\underset{+}{-10x}$
$14x - 75$
$\underset{-}{14x}\underset{+}{-70}$
-5

5 must be added to the given polynomial that is exactly divisible by $(x - 5)$.

281. (d) ATQ,

$\frac{N}{6} \rightarrow R = 3, N = 6 + 3 = 9$

$\therefore \frac{N^2 + 5N + 8}{6} = \frac{9^2 + 9 \times 5 + 8}{6} = 2$

Alternate Method:

Given, remainder = 3

$\frac{N^2 + 5N + 8}{6} = \frac{3^2 + 5 \times 3 + 8}{6} = 2$

282. (c) $(m^{12} - 1) \div (m + 1)$
put m + 1 = 0
m = − 1
$\therefore m^{12} - 1, = (-1)^{12} - 1 = 1 - 1 = 0$
$\therefore$ Remainder = 0

Alternate Method:

Note:- $a^m - b^m$ is divisible by $(a - b)$ and $(a + b)$ if m is a even number
Here, $m^{12} - 1$ is completely divisible by m − 1
Hence, R = 0

283. (d) If $f(x) = 15x^3 - 14x^2 - 4x + 10$ ...(i)
$f(x)$ is completely divisible by $(3x + 2)$
$\Rightarrow$ Then, $3x + 2 = 0$

$x = \frac{-2}{3}$ satisfies equation (i)

Put $x = \frac{-2}{3}$ in eq. (i)

$f\left(\frac{-2}{3}\right) = 15\left(\frac{-8}{27}\right) - 14\left(\frac{4}{9}\right) - 4\left(\frac{-2}{3}\right) + 10$

$= \frac{-40}{9} - \frac{56}{9} + \frac{24}{9} + \frac{90}{9} = \frac{18}{9} = 2$

Hence, remainder is = 2

Alternate Method:

$f(x) = 15x^3 - 14x^2 - 4x + 10$
$3x + 2 \Rightarrow 3x = -2$
$R = 3x \times 5x^2 - 14x^2 - 4x + 10$
$= -2 \times 5x^2 - 14x^2 - 4x + 10$
$= -24x^2 - 4x + 10$
$= -3x \times 8x - 4x + 10$
$= 16x - 4x + 10 = 12x + 10$
$= 3x \times 4 + 10 = -2 \times 4 + 10 = 2$

Method: (ii)

$3x + 2\overline{)15x^3 - 14x^2 - 4x + 10}(5x^2 - 8x + 4$
$\underset{-}{15x^3}\underset{-}{\pm}10x^2$
$-24x^2 - 4x$
$\underset{+}{\overset{-}{}}24x^2 \underset{+}{\overset{-}{}}16x$
$12x + 10$
$\underset{-}{12x}\underset{-}{\pm}8$
Remainder$\rightarrow$2

284. (b) Given, remainder = 2

$R \rightarrow \frac{n^2 + n + 2}{6} = \frac{2^2 + 2 + 2}{6} \Rightarrow R \rightarrow 2$

285. (c) $\frac{n}{6} \Rightarrow R = 3$

$\frac{n^4 + n^3 + n^2 + 5n}{6}$

$= \frac{(3)^4 + (3)^3 + (3)^2 + 5 \times 3}{6}$

$= \frac{81 + 27 + 9 + 15}{6} = \frac{132}{6}$

$\Rightarrow R = 0$

286. (a) $2x - 3 = 0 \Rightarrow x = \frac{3}{2}$
$f(x) = 2x^3 - 3x^2 + 6x - 4$
Put $x = \frac{3}{2}$,

$\Rightarrow 2\times\left(\frac{3}{2}\right)^3 - 3\times\left(\frac{3}{2}\right)^2 + 6\times\frac{3}{2} - 4$

$= 2\times\frac{27}{8} - 3\times\frac{9}{4} + 9 - 4$

$= \frac{27}{4} - \frac{27}{4} + 5 = 5$

$\therefore$ Remainder = 5

Alternate Method:

$2x-3\overline{)2x^3 - 3x^2 + 6x - 4}(x^2 + 3$
$\underset{-}{2x^3}\underset{-}{-3x^2}$
$6x - 4$
$\underset{-}{6x}\underset{-}{-9}$
+5 Remainder

287. (d) $\frac{3^8}{7} = \frac{(3^3)^2 \times 3^2}{7} = \frac{(-1)^2 \times 3^2}{7} = \frac{9}{7}$
$\therefore R = 2$

288. (a) Required Remainder $= \frac{8^8 + 6}{7}$

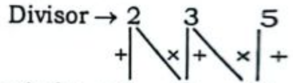
$= \frac{(1)^8 + (-1)}{7} = \frac{0}{7} \Rightarrow R = 0$

289. (a) Let x be the number

3	x
4	y − 2
7	z − 3
	1 − 5

$\Rightarrow z = 7 \times 1 + 5 = 12$
$\Rightarrow y = 4 \times z + 3 = 51$
$\Rightarrow x = 3 \times y + 2 = 155$
On dividing 155 by 84
$\therefore$ Remainder = 71

290. (a)

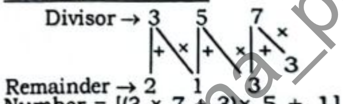


Number = [(5 + 3) × 3 + 2] × 2 + 1
= 26 × 2 + 1 = 53
When 53 is divisible by 13, remainder = 1

291. (c)

		Rem.
3	3 × 121 + 2 = 365	2
5	5 × 24 + 1 = 121	1
7	7 × 3 + 3 = 24	3
	Q → 3	

Alternate Method:



Number = [(3 × 7 + 3) × 5 + 1] × 3 + 2 = [24 × 5 + 1] × 3 + 2 = 121 × 3 + 2 = 365

292. (a)

3	155	R
4	51 →	2
7	12 →	3
	1 →	5

$\because$ 7 × 1 + 5 = 12
12 × 4 + 3 = 51
51 × 3 + 2 = 155 (Required no.)

So, $\frac{155}{84} \Rightarrow$ Remainder = 71

293. (d)

3	155	R
4	51 →	2
7	12 →	3
	1 →	5

$7 \times 1 + 5 = 12$
$12 \times 4 + 3 = 51$
$51 \times 3 + 2 = 155$

$\frac{155}{42} \Rightarrow$ Remainder = 29

294. (d) ATQ,
$x = 3y + 2,\ y = 7a + 5$
$\Rightarrow x = 3[7a + 5] + 2$
$= 21a + 15 + 2 = 21a + 17$
Hence, x is divided by 21, remainder is 17.

Alternate Method:

divisor		Remainder
3	38	2
7	12	5

1 → Let the last quotient be 1

$7 \times 1 + 5 = 12$
$12 \times 3 + 2 = 38$
Original no = 38

$\therefore$ Remainder = $\frac{38}{21} = 17$

295. (b)

		Rem.
2	$2 \times 184 + 1 = 369$ ←	1
3	$3 \times 60 + 4 = 184$ ←	4
5	$5 \times 12 + 0 = 60$ ←	0
7	$7 \times 1 + 5 = 12$ ←	5
	1(let)	

Number = $[\{(1 \times 7 + 5) \times 5 + 0\} \times 3 + 4] \times 2 + 1$
$= [60 \times 3 + 4] \times 2 + 1 = 184 \times 2 + 1$
$= 369$
When no. is successively divided by 7, 5, 3 and 2

7	369	Remainder
5	52	5
3	10	2
2	3	1
	1	1

$\therefore$ Sum of remainder = $5 + 2 + 1 + 1 = 9$

296. (b) Divisor must be always greater than remainder. option (a) and (d) eliminated.
Divisor = Remainder 1 + Remainder 2 – Remainder 3
$= 6 + 7 - 5 = 13 - 5 = 8$

297. (c) Largest 5 digit no. = 99999

47)99999(2127
–94
59
–47
129
–94
359
–329
30

$\therefore$ Number = $99999 - 30 = 99969$

298. (c) 99)999(10
990
→09

$\therefore$ Required smallest number.
$= 99 - 9 = 90$

299. (c) 11 Divisibility:
$\frac{(\text{sum of odd place} - \text{sum of even place})}{11}$

Now,
Sum of even places = $1 + 4 + 7 + 6 = 18$
Sum of odd places = $9 + 8 + 1 + 1 = 19$
ATQ,
$\frac{(\text{sum of odd place} - \text{sum of even place})}{11}$
$= \frac{(18-19)}{11} = -1$
19487161 is divisible, when (11 – 1) 10 is added.

300. (b) 17)2001(117
17
30
17
131
119
12→Remaining

$= \frac{2001-12}{17} = \frac{1989}{17} \Rightarrow R = 0$
So, the no. 12 should be subtract

301. (b) Let number = $33x$
After summation of 21
$33x + 21 = 3(11x + 7)$
So, number is divided by 3

302. (d) Let, largest 6-digit number
= 999999

294)999999(3401
– 882
1179
– 1176
399
–294
105 → Remainder

$\therefore$ Number to be added
$= 294 - 105 = 189$

303. (b) ATQ,
$\frac{1000}{55} \to R = 10$
Smallest number to be added
$= 55 - 10 = 45$

304. (c) **Divisibility of 8:** last 3 digit of no. is divisible by 8
$\frac{326}{8} \to R = 6$
Thus, Required smallest no. is 6.

305. (b) **8 Divisibility:** Last 3 digit of number should be divisible by 8.
11 Divisibility: Sum of odd Place value – Sum of even Place value
= 0 or 11

$$\begin{tikzcd}[column sep=tiny] & 88 \arrow[dl, no head] \arrow[dr, no head] & \\ 8 & \times & 11 \end{tikzcd}$$
88 → Factors

By option,
(a) $\frac{99990}{8} \to R = 6$
(b) $\frac{99968}{8} \to R = 0,$
So, Check 11 divisibility also here,

Odd →
9 9 9 6 8
Even →

$\Rightarrow (9 + 9 + 8) - (9 + 6)$
$\Rightarrow (26 - 15) = 11$
So, option (b) is the correct answer.

306. (a) Let the 6 digit no. be N
$\therefore$ N is divisible by 33
$N = 33 \times x$
$\Rightarrow$ New no = $33x + 54$
$(33x + 54)$ must be divisible by 3.
Hence, option (a) satisfied

307. (a) No is divisible by 35 < 5, 7
It must be end with 0 or 5.
By options,
$888 + 22 = 910$
910 is divisible by 7 & 5 both
It will also divisible by 35

308. (a) $\frac{10000}{526} \to R = 6$
Now $\Rightarrow 526 - 6 = 520$
Smallest five digit number which is completely divisible by 576
$\Rightarrow 10000 + 520 = 10520.$

309. (c) Greatest 4 digit no. = 9999
LCM (3, 4) = 12
Then, $\frac{9999}{12} \to R = 3$
Number = $9999 - 3 = 9996$
$\therefore$ Required number = $9996 + 2$
$= 9998$

310. (b) ATQ,
$\frac{87501}{765} \to R = 291$
Number = $765 - 291 = 474$
Number greater than 87501
$= 87501 + 474 = 87975$

311. (d) $\frac{4567}{7} \to R = 3$
$\therefore (7 - 3) = 4$ should be added

312. (c) Result = $(9435 + 7593) - 2607$
$= 14421 = \frac{1+4+4+2+1}{3} \to R = 0$
$\therefore$ Divisible by 3.

313. (b) Number = 763254
New Number = $763254 - 5 \times 41$
$= 763254 - 205 = 763049$
Divisibility Rule of 7: First we make pair of 3 digit number from right side and then subtract the alternate pair. If resultant is divisible by 7 then initial number must be divisible by 7.
$\underline{763}\ \underline{049} = 763 - 049 = 714$
$\frac{714}{7} \to R = 0$
$\therefore$ 763049 is divisible by 7

314. (a) LCM of 5, 35, 39, 65 = 105×13
No. = 1365
$\frac{99999}{1365} \to R = 354$
Required no. $99999 - 354 = 99645$
$\therefore$ Sum of digit = 33

315. (c)Given number -10424
Let the least no. be x
ATQ,
$10424 - x$ = perfect square no.
$10424 - x = (102)^2 + 20 - x$
$\Rightarrow x = 20$
To make perfect square number we should multiply by 5.
i.e. $20 \times 5 = 100 = (10)^2$
Hence, required no. = 5

316. (c) For finding the required remainder put
$2x - 1 = 0 \Rightarrow x = \frac{1}{2}$

Required remainder

$$= 3\left(\frac{1}{2}\right)^4 - 2\left(\frac{1}{2}\right)^2 + 4\left(\frac{1}{2}\right) - 1$$

$$= \frac{3}{16} - \frac{1}{2} + 2 - 1 = \frac{3}{16} + \frac{1}{2} = \frac{11}{16}$$

317. (b) Let two digit no. = $10x + y$

$(10x + y) - (10y + x) = 9$

$\Rightarrow 9x - 9y = 9$

$\Rightarrow x - y = 1$ .....(i)

$10x + y = 5(x + y) + 12$

$\Rightarrow 10x + y = 5x + 5y + 12$

$\Rightarrow 5x - 4y = 12$

From (i) and (ii)

$5(1 + y) - 4y = 12$

$\Rightarrow 5 + 5y - 4y = 12 \Rightarrow y = 7$

and $x = 8$

Number = $10 \times 8 + 7 = 87$

Alternate Method:

By options,

$87 - 78 = 9$ (satisfy)

$87 = 5(8 + 7) + 12 \Rightarrow 87 = 75 + 12$

$\Rightarrow 87 = 87$

SMART APPROACH:-

Number is 12 more than five times the sum of its digit it means if we subtract 12 from that number then it is divisible by 5 only option (b) satisfied.

318. (d) Let, two digit no is $10x + y$

ATQ,

$x + y = 9$ .....(i)

$10y + x - (10x + y) = 27$

$\Rightarrow 9y - 9x = 27 \Rightarrow y - x = 3$ ....(ii)

From equation (i) and (ii),

$y = 6, x = 3$

$\therefore$ Number = $10x + y \Rightarrow 10 \times 3 + 6 = 36$

Alternate Method:

By option (d)

36 → Sum of digit = 9

The digit are reversed = 36 → 63

Increased by 27, option (d) is satisfied.

319. (b) Let, two digit no. is $10x + y$

ATQ,

$x + y = 9$ .....(i)

$10y + x - (10x + y) = 45$

$\Rightarrow 9y - 9x = 45 \Rightarrow y - x = 5$ .....(ii)

From eqn. (i) and (ii), $x = 2, y = 7$

$\therefore$ Original no. = $10x + y$

$= 10 \times 2 + 7 = 27$

Alternate Method:

$27 \Rightarrow 2 + 7 = 9$

$72 - 27 = 45$

The given number satisfy the given statement in question

So, the original number = 27

320. (c) Let, number = $10x + y$

ATQ,

$(10x + y) + (10y + x) = 77$

$x + y = 7$ ....(i)

$x - y = 1$ ....(ii)

On solving equation (i) and (ii),

$x = 4$ and $y = 3$

Hence, Number = $10x + y$

$= 10 \times 4 + 3 = 43$

Alternate Method:

By option (c)

When 43 is interchanged the number is 34.

Now, sum of these number

$= 43 + 34 = 77$

321. (a) ATQ,

Let the number be $(10x + y)$

$(10x + y) - (10y + x) = 36$

$\Rightarrow 9(x - y) = 36 \Rightarrow x - y = 4$

I. Correct

II. Possible values → 51, 62, 73, 84, 95 ⇒ true

III. All possible numbers are not composite (73) ⇒ false.

322. (a) Let, the no. be x.

ATQ,

$$\Rightarrow \frac{x}{5} + 5 = \frac{x}{3} - 7 \quad \Rightarrow \frac{2x}{15} = 12$$

$\Rightarrow x = 90$

$$\therefore \frac{x}{2} = \frac{90}{2} = 45$$

323. (a) Let, five Consecutive number

$= x, x + 1, x + 2, x + 3$ and $x + 4$

So, $x + x + 1 + x + 2 + x + 3 + x + 4 = 80$

$\Rightarrow 5x = 80 - 10 \Rightarrow x = 14$

$\therefore$ Largest consecutive number

$= 14 + 4 = 18$

Alternate Method:-

$$\text{Average of 5 number} = \frac{80}{5} = 16$$

Middle no.

↓

14 15 16 17 18

↑

Largest no.

324. (c) Let, the two consecutive even no. be x & $x + 2$

Sum = $x + (x + 2) = 2x + 2$

ATQ,

$$2x + 2 = 174 \Rightarrow x = \frac{172}{2} = 86$$

$\therefore$ Smaller no. = 86

Alternate Method:-

$$\text{Average} = \frac{174}{2} = 87$$

Middle no.

↓

86 87 88

↑

Smaller no.

325. (c) Let, No are $x, x + 2, x + 4, x + 6, x + 8$

Sum = 2720

$$\text{Average} = \frac{2720}{5} = 544.$$

$x + 4 = 544$

$\Rightarrow x = 540$

$\therefore$ III → $540 + 4 = 544$.

V → $540 + 8 = 548$

Sum = $544 + 548 = 1092$

326. (c) Let, the three consecutive composite number be $x, x + 2, x + 4$

ATQ,

$x + (x + 2) + (x + 4) = 36$

$\Rightarrow x = 10$

$\therefore$ Product of three number

$= 10 \times (10 + 2) \times (10 + 4) = 1680$

327. (b) Let the number A and B

Given that,

$A + B = 25, \ AB = 144$

$(A - B)^2 = (A + B)^2 - 4AB$

$\Rightarrow (A - B)^2 = 25^2 - 4 \times 144$

$\therefore A - B = 7$

328. (c) Two digit even number

$= 10, 12, 14, 16, \ldots 98$

$$n = \frac{l - a}{\text{diff.}} + 1 = \frac{98 - 10}{2} + 1 = 44 + 1 = 45$$

$$\text{Now, } S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$= \frac{45}{2}[2 \times 10 + (45 - 1)2]$$

$$= \frac{45}{2}(20 + 88) = 2430$$

329. (b) Sum of all two digit odd numbers

11, 13 99

$$n = \frac{99 - 11}{2} + 1$$

$$= \frac{88}{2} + 1 \Rightarrow 44 + 1 = 45$$

$$S_n = \frac{n}{2}(a + l)$$

$$S_n = \frac{45}{2}(11 + 99)$$

$$S_n = \frac{45}{2} \times 110 \Rightarrow 45 \times 55 = 2475$$

330. (a) Number of digits required for numbering 1 to 9 pages = 9

Number of digits required for numbering 10 to 99 pages = $90 \times 2 = 180$

Number of digits required for numbering 100 to 428 pages = $329 \times 3 = 987$

Total number of digits

$= 9 + 180 + 987 = 1176$

331. (b) Let, larger part = x

ATQ,

$6x + 4(25 - x) = 130$

$\Rightarrow 6x + 100 - 4x = 130$

$\Rightarrow x = 15$

332. (a) Let, Larger number = x

Smaller number = y.

$x + y = 76$ .....(i)

ATQ,

$3x - 4y = 46$ .....(ii)

On, 4 × (i) + (ii)

$7x = 350$,

$\Rightarrow x = 50$, Then $y = 76 - x$

$\Rightarrow 76 - 50 = 26$

Hence, largest and smaller number are 50 and 26 respectively.

333. (d) Given, $x + y = 12, xy = 27$

$\therefore x^3 + y^3 = (x + y)[(x + y)^2 - 3xy]$

$= 12[144 - 3 \times 27]$

$= 12 \times (144 - 81) = 12 \times 63 = 756$

334. (a) Let the two number x and y

$x + y = 28$

$x^2 + y^2 = 528$

$\therefore (x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow (28)^2 = 528 + 2xy$

$\Rightarrow 784 = 528 + 2xy$

$\Rightarrow 2xy = 256 \Rightarrow xy = 128$

$\therefore \sqrt{xy} = 8\sqrt{2}$

335. (a) $\text{Revolutions} \propto \dfrac{1}{\text{Radius or diameter}}$

A.T.Q, Smaller Gear : Larger Gear

Diameter → 15 : 21

Revolution → 21 : 15

$$\begin{array}{ccc} 21 & : & 15 \\ \downarrow{\times 5} & & \downarrow{\times 5} \\ 105 & & \boxed{75} \end{array}$$

$\therefore$ Larger gear has 75 revolution.

336. (d) Boys + Girls = 18

ATQ,

Boys + 8 = Girls

Boys + Boys + 8 = 18

2Boys = 10

Boys = 5, Girls = 13

Now, Boys × Girls = 13 × 5 = 65

337. (d) Let the number is x.
ATQ,
$x - \frac{5}{6}x = 10 \Rightarrow x = 60$
Now, $\frac{7}{5}x = \frac{7}{5} \times 60 = 84$

Alternate Method:

$5 \leftarrow$ 1 unit → 10
$6 \rightarrow$ original no.
6 unit = 60
$\therefore 60 \times \frac{7}{5} = 84$

338. (c) ATQ,
$(72)^2 = 216 \times x$
$\therefore x = \frac{72 \times 72}{216} = 24$

339. (c) Let, the no. be x
$x + \frac{1}{x} = 4$
$x^2 + \frac{1}{x^2} = 16 - 2 = 14$

340. (d) Let, the no. are a and b
$a^2 + b^2 = 12, \quad ab = 4$
$\because (a - b)^2 = a^2 + b^2 - 2ab$
$\Rightarrow (a - b)^2 = 12 - 8$
$\therefore a - b = \sqrt{4} = 2$

341. (c) Let the certain number be x
$\Rightarrow \left\{\frac{(x+7) \times 5}{3}\right\} - 4 = 16$
$\Rightarrow x + 7 = 12 \Rightarrow x = 5$

342. (a) Let the value of C is x

$$\begin{array}{ccc} A & B & C \\ \downarrow & \downarrow & \downarrow \\ x+23 & x+16 & x \end{array}$$

Given that,
$A + B + C = 255$
$\Rightarrow (x + 23) + (x + 16) + x = 255$
$\Rightarrow 3x + 39 = 255$
$\Rightarrow 3x = 255 - 39 \Rightarrow 3x = 216$
$\Rightarrow x = \frac{216}{3} = 72$
Hence, C = 72, B = 88, A = 95
$\therefore 3A + C - 4B = 3(95) + 72 - 4(88)$
$= 285 + 72 - 352 = 357 - 352 = 5$

343. (b) Assume Larger Number = x and Smaller Number = y
$\Rightarrow x - y = 3951$ ....(i)
$x = 12y + 13$ (Given)
$\Rightarrow x - 12y = 13$ ....(ii)
Solving equation (i) and (ii),
y = 358
$\therefore x = 3951 + 358 = 4309$
Thus, sum of digits
$= 4 + 3 + 0 + 9 = 16$

344. (d) Let apple x kg and orange y kg
ATQ,
$8x + 10y = 5$ ....(i)
$12x + 20y = 9$ .....(ii)
Multiply equation (i) by 2 and we get
$4x = 1$
$x = \frac{1}{4}$
Putting value of x in equation (ii)
$y = \frac{3}{10}$.
$15x + 24y = \frac{15}{4} + \frac{72}{10} = \frac{75+144}{20}$
$= \frac{219}{20} \sim 11$

345. (c)
21 Pencils + 9 pens = 276 .....(i)
6 Pencils + 3 pens = 84 .....(ii) $\times 3$
21 Pencils + 9 pens = 276
18 Pencils + 9 pens = 252
$-\quad\quad -\quad\quad -$

3 Pencils = 24
1 Pencil = 8
Now, 21×8 + 9 pens = 276
⇒ 9 pens = 276 − 168 = 108
⇒ 1 pen = 12
∴ 1 pencil + 1 pen = 8 + 12 = ₹20

346. (a) ATQ,
$x + y = 4(x - y)$
$\Rightarrow x + y = 4x - 4y$
$\Rightarrow 5y = 3x$
$\Rightarrow \frac{y}{x} = \frac{3}{5}$
Let, $y = 3k$, $x = 5k$
Now,
$\therefore \frac{5xy}{3(x^2 - y^2)} = \frac{5 \times 3 \times 5k^2}{3k^2(5^2 - 3^2)} \Rightarrow \frac{75}{3 \times 16} = \frac{25}{16}$

347. (b) $847 \times 385 \times 675 \times 3025 = 3^a \times 5^b \times 7^c \times 11^d$
$\Rightarrow 3^3 \times 5^5 \times 7^2 \times 11^5 = 3^a \times 5^b \times 7^c \times 11^d$
Comparing on both side
a = 3, b = 5, c = 2, d = 5
$\therefore ab - cd = 15 - 10 = 5$

348. (b) $\frac{c}{a} = \frac{5}{2} = b + \frac{7}{4}$
$\Rightarrow b = \frac{5}{2} - \frac{7}{4} \Rightarrow b = \frac{3}{4}$
$a + b + c = \frac{23}{12} \Rightarrow a + c = \frac{23}{12} - \frac{3}{4}$
$\Rightarrow a + c = \frac{7}{6}$
Let, $a = 2x$, $c = 5x$
$2x + 5x = \frac{7}{6} \Rightarrow x = \frac{1}{6}$
$\therefore c - a = 3x = 3 \times \frac{1}{6} = \frac{1}{2}$

349. (c) Mean proportion of $7\frac{1}{5}$ & 245
$= \sqrt{ab} = \sqrt{\frac{36}{5} \times 245}$
$= \sqrt{36 \times 49} = 6 \times 7 = 42$
Even prime number = 2
$\therefore$ Quotient $= \frac{42}{2} = 21$

350. (b) The hour hand and minute hand of a clock coincide 11 times In 12 hour (Half day).
They don't coincide between 12 and 1 o clock.

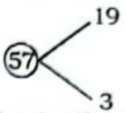
351. (c) $x > y > z$
$\frac{z}{x} = \frac{9}{16} = y + 0.0625$
$y = \frac{9}{16} - \frac{1}{16} = \frac{1}{2}$
$x + y + z = 1 + \frac{13}{24} = \frac{37}{24}$
$x + z = \frac{37}{24} - \frac{1}{2} = \frac{25}{24}$

352. (d) Given, 6 + 8 + 10 + 12......+40
First term = 6, last term = 40, diff. = 8 − 6 = 2
$N = \frac{40-6}{2} + 1 = 18$
$S_N = \frac{N}{2}$(First + last)
$= \frac{18}{2}(6 + 40) = 414$

353. (c) Let, number = $10x + y$
$(10x + y)(x + y) = 424$ ...(i)
$(10y + x)(y + x) = 280$ ...(ii)
After Dividing eq. (i) by eq. (ii) -
$\frac{(10x + y)(x + y)}{(10y + x)(y + x)} = \frac{424}{280}$
$\Rightarrow 350x + 35y = 530y + 53x$
$\Rightarrow 297x = 495y$
$\Rightarrow \frac{x}{y} = \frac{5}{3}$
∴ Required no. = 5 + 3 = 8

354. (d) From 400 – 500 = 466
From 500 – 600 = 566
From 600 – 700 = 606, 616, 626, 660, 661, 662, 663, 636, 664, 646, 665, 656, 667, 676, 668, 686, 669, 696
⇒ Total numbers = 20

355. (c) Given number → 468312



4 + 6 + 8 + 3 + 1 + 2 = 24
$\Rightarrow \frac{24}{3} \rightarrow R = 0$
So, if its digits are reversed then it is still divisible by 3.

356. (b) Let the number of years = x
ATQ, $6 + 3x = 26 - 2x$
$\Rightarrow 5x = 20$
$x = 4$ years

357. (d) 2B + 1 cho. = 69 ....(i)
3 coff. + 2 cho. = 127 ....(ii)
3B + 4 cho. + 2 coff. = 229 ....(iii)
By (i) and (ii),
4B − 3 coff. = 11 ....(iv)
By (iii) and (iv),
17B + 12 cho. = 709 ....(v)
By (i) and (v),
1 chocolate = ₹35,
1 coffee = ₹19 and 1 biscuit = ₹17
∴ 5B + 5 coff. + 5 cho.
= 5(35 + 19 + 17)
= 5 × 71 = ₹355

358. (b) Let, Anna has no. of marbles = x
Ben has no. of marbles = y
ATQ,
$x - 1 = y + 1 \Rightarrow x - y = 2$ .....(i)
$x + 1 = 3(y - 1) \Rightarrow x + 1 = 3y - 3$
$\Rightarrow x - 3y = -4$ .....(ii)
From eqn. (i) and (ii),
$y = 3$, $x = 5$
∴ Total number of marbles
= 3 + 5 = 8

359.(b) Given,
Let, $K = x + 12$, $R = x$
ATQ,
$\Rightarrow 3(x + 12 + 1) = 4(x + 1)$
$\Rightarrow 3x + 39 = 4x + 4 \Rightarrow x = 35$
∴ K = 35 + 12 = 47 marbles

360. (a) Let, week no. = x
ATQ,
$11000 + 5000x = 60000 - 2000x$
$\Rightarrow 7000x = 49000 \Rightarrow x = 7$
Hence, after 7th week they will have same amount of money

19
Chapter

LCM & HCF

◆ TYPE – I ◆
BASIC QUESTIONS

1. The LCM of 144, 360 and 450 is:

SSC CGL 09/12/2022 (Shift-02)

(a) 4800 (b) 3600
(c) 7200 (d) 2400

2. The HCF of three numbers 105, 335 and 465 will be:

SSC CGL 08/12/2022 (Shift-01)

(a) 11 (b) 5
(c) 7 (d) 3

3. What is the largest common divisor of the numbers 1026, 2268 and 2430?

SSC CGL 02/12/2022 (Shift-01)

(a) 108 (b) 54
(c) 81 (d) 27

4. The least common multiple of 48 and 64 is _______ times the highest common factor of 12 and 18.

SSC CPO 10/11/2022 (Shift-01)

(a) 28 (b) 32
(c) 24 (d) 16

5. The highest common factor of 108, 72 and 5a is a. What can be the least common multiple of 108, 72 and a?

SSC CPO 10/11/2022 (Shift-02)

(a) 432 (b) 324
(c) 108 (d) 216

6. If $P = 2^8 \times 3^5$, $Q = 2^3 \times 3^4$, and $R = 3^5 \times 2^7$ then what is the highest common factor of P, Q and R?

SSC MTS 06/07/2022 (Shift-02)

(a) $2^3 \times 3^4$ (b) $2^8 \times 3^5$
(c) $2^2 \times 3^2$ (d) $2^4 \times 3^5$

7. The LCM of $2^3 \times 9^2 \times 13$, $2^2 \times 13^2 \times 19$ and $9^3 \times 13^2 \times 19^2$ is:

SSC CGL TIER-II (20/01/2025)

(a) $2^3 \times 9^2 \times 13^2 \times 19$
(b) $2^3 \times 9^3 \times 13^2 \times 19^2$
(c) $2^2 \times 9^2 \times 13^2 \times 19^3$
(d) $2^2 \times 9^3 \times 13 \times 19^2$

8. The LCM of $\frac{3}{8}, \frac{5}{16}$ and $\frac{7}{2}$ is

SSC CGL 09/12/2022 (Shift-04)

(a) $101\frac{1}{2}$ (b) $52\frac{1}{2}$
(c) $28\frac{1}{2}$ (d) $25\frac{1}{4}$

9. The HCF of $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}$ and $\frac{7}{8}$ is.

SSC CGL 09/12/2022 (Shift-03)

(a) $\frac{105}{2}$ (b) $\frac{1}{24}$
(c) $\frac{7}{24}$ (d) $\frac{1}{48}$

10. Calculate the HCF of $\frac{12}{5}, \frac{14}{15}$ and $\frac{16}{17}$.

SSC CGL 03/12/2022 (Shift-01)

(a) $\frac{4}{255}$ (b) $\frac{3}{255}$
(c) $\frac{2}{255}$ (d) $\frac{1}{255}$

11. What is the LCM of 0.15, 0.18 and 0.45?

SSC CPO 05/10/2023 (Shift-02)

(a) 0.6 (b) 0.9
(c) 0.81 (d) 0.09

12. Find the LCM of 186.6 and 373.2.

SSC CGL 07/12/2022 (Shift-03)

(a) 373.2 (b) 398.2
(c) 186.6 (d) 276.6

13. What is the LCM of .126, 0.36 and 0.96?

SSC MTS 20/10/2021 (Shift-03)

(a) 20160 (b) 20.16
(c) 201.60 (d) 2.016

14. The LCM of $x^2 - 8x + 15$ & $x^2 - 5x + 6$ is:

SSC CPO 05/10/2023 (Shift-2)

(a) $(x + 5)(x + 2)(x + 3)$
(b) $(x - 5)(x - 2)(x - 3)$
(c) $(x + 5)(x - 2)(x - 3)$
(d) $(x - 2)(x - 3)^2(x - 5)$

15. What is the HCF of $(x^6 + 1)$ & $(x^4 - 1)$?

SSC CPO 05/10/2023 (Shift-01)

(a) $(1 + x^2)$ (b) $(1 + x)$
(c) 1 (d) $(1 - x^2)$

16. If the greatest common factor (HCF) of x and y is 15, then the HCF of $36x^2 - 81y^2$ and $81x^2 - 9y^2$ is divisible by _________?

SSC CGL TIER- II 06/03/2023

(a) 135 (b) 120
(c) 90 (d) 180

17. What is the LCM of $(8x^3 + 80x^2 + 200x)$ and $(4x^4 + 16x^3 - 20x^2)$?

SSC CGL 07/12/2022 (Shift 01)

(a) $8x^2(x + 5)^2(x - 1)$
(b) $8x^2(x - 1)^2(x + 5)$
(c) $4x^2(x - 1)^2(x + 5)$
(d) $4x^2(x + 5)^2(x - 1)$

18. What is the HCF of the polynomials $(x^3 - 8)$, $(x^3 - 6x^2 + 12x - 8)$ and $(x^3 - 4x^2 + 4x)$?

SSC MTS 12/09/2023 (Shift- 03)

(a) $(x - 2)$ (b) $(x - 1)$
(c) $(x - 4)$ (d) $(x - 8)$

19. If the HCF of xy^3, x^2y and x^3y^4 is xy, then their LCM is _____.

SSC CGL 08/12/2022 (Shift-04)

(a) x^3y^4 (b) x^3y^3
(c) x^4y^3 (d) x^4y^4

20. What is the LCM of $a^3b - ab^3$, $a^3b^2 - a^2b^3$, $ab(a - b)$?

SSC CPO 11/11/2022 (Shift-02)

(a) $a^2b^2(a^2 + b^2)$ (b) $a^2b^2(a^2 - b^2)$
(c) $a^2b^3(a^2 + b^2)$ (d) $a^3b^2(a^2 - b^2)$

◆ TYPE – II ◆
WHEN THE RATIO OF NUMBERS IS GIVEN

21. The LCM of two numbers is 120 and the numbers are in the ratio 3 : 8. The sum of the numbers will be:

SSC CGL 03/12/2022 (Shift-03)

(a) 48 (b) 55
(c) 45 (d) 60

22. Three numbers are in the ratio 5 : 7 : 9, and their LCM is 1260. What is the difference between the largest and the smallest number?

SSC CHSL TIER-II (18/11/2024)

(a) 20 (b) 24
(c) 16 (d) 32

23. Three numbers are in the ratio of 5 : 7 : 9 and their LCM is 34,650. Their HCF is:

SSC CPO 05/10/2023 (Shift-01)

(a) 110 (b) 315
(c) 99 (d) 55

24. The HCF of two numbers is 17 and the other two factors of their LCM are 11 and 19. The smaller of the two numbers is:

SSC CGL 13/12/2022 (Shift-02)

(a) 209 (b) 187
(c) 323 (d) 306

25. Three numbers are in the ratio of 2 : 3 : 5 and their LCM is 90. Find their HCF.

SSC CGL 02/12/2022 (Shift-04)

(a) 9 (b) 1
(c) 6 (d) 3

26. Three numbers are in the ratio $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ If the difference between the greatest number and the smallest number is 33, then HCF of the three numbers is:

SSC CGL TIER II 03/02/2022

(a) 9 (b) 5
(c) 13 (d) 11

27. Two numbers are in the ratio 7:11. If their HCF is 28, then the difference between the two numbers is:

SSC CPO 23/11/2020 (Shift-01)

(a) 28 (b) 196
(c) 112 (d) 308

28. The least common multiple of a and b is 42. The LCM of 5a and 11b is:
SSC CPO 09/11/2022 (Shift-01)
(a) 2310 (b) 4620
(c) 210 (d) 462

◆ TYPE – III ◆
1st NUMBER × 2nd NUMBER = L.C.M. × H.C.F.

29. The HCF of two numbers is 21 and their LCM is 840. If one of the numbers is 49, then the other number is:
SSC CGL 12/12/2022 (Shift-01)
(a) 650 (b) 540
(c) 810 (d) 360

30. The LCM of the two numbers is 4104 and the HCF is 9. If one of the numbers is 171, find the other.
SSC CGL 05/12/2022 (Shift-04)
(a) 218 (b) 215
(c) 220 (d) 216

31. The product of two numbers is 726 and their HCF is 11, then their LCM is:
SSC CPO 03/10/2023 (Shift-01)
(a) 68 (b) 76
(c) 66 (d) 58

32. The LCM of x and y is 441 and their HCF is 7. If $x = 49$ then find y.
SSC CPO 09/11/2022 (Shift-03)
(a) 56 (b) 36
(c) 65 (d) 63

33. If K_1 and K_2 are two distinct prime numbers, then what is the product of the highest common factor and the least common multiple of K_1 and K_2?
SSC MTS 20/07/2022 (Shift - 02)
(a) 1 (b) $\frac{K_1}{K_2}$
(c) $K_1 + K_2$ (d) $K_1 \times K_2$

34. Let the HCF of m and n be 'a' and let n = ab, LCM of m and n is given by:
SSC CPO 04/10/2023 (Shift-01)
(a) ab (b) am
(c) bm (d) mn

35. The least common multiple (LCM) of p and q is r. The LCM of p^2q and pq^2 is ....
SSC MTS 04/09/2023 (Shift- 02)
(a) pqr (b) pq
(c) pqr^2 (d) pqr^3

36. The sum of and difference between the LCM and HCF of two numbers are 512 and 496, respectively. If one number is 72, then the other number is:
SSC CGL TIER II 29/01/2022
(a) 55 (b) 89
(c) 62 (d) 56

37. The HCF of two numbers is 21 and their LCM is 221 times the HCF. If one of the numbers lies between 200 and 300, then the sum of the digits of the other number is:
SSC CGL TIER-II 12/09/2019
(a) 14 (b) 17
(c) 18 (d) 15

38. The greatest common multiple (HCF) of two numbers is $\left(\frac{1}{20}\right)$ of their least common multiple (LCM). If a number is 96 and the difference between the least common multiple and the greatest common multiple is 456, then what will be the other number?
SSC CHSL TIER-II 26/06/2023
(a) 48 (b) 120
(c) 144 (d) 72

39. LCM of two numbers is 56 times their HCF. Sum of their HCF and LCM is 1710. If one of the two numbers is 240, then what is the other number?
SSC CGL 11/04/2022 (Shift-01)
(a) 57 (b) 171
(c) 1680 (d) 210

40. LCM of two numbers is 22 times their HCF. If one of the numbers is 132 and the sum of LCM and HCF is 276, then what is the other number?
SSC CGL 18/04/2022 (Shift-01)
(a) 24 (b) 30
(c) 25 (d) 20

41. The LCM of two numbers x and y is 204 times their HCF. If their HCF is 12 and the difference between the number is 60, then $x + y$ = ?
SSC CGL TIER II 13/09/2019
(a) 660 (b) 426
(c) 852 (d) 348

42. If the HCF of two numbers is 8, then which of the following can never be their LCM?
SSC CGL 07/12/2022 (Shift-04)
(a) 56 (b) 48
(c) 42 (d) 40

43. The HCF of two numbers is 12. Which one of the following can never be their LCM?
SSC CGL 01/12/2022 (Shift-01)
(a) 72 (b) 60
(c) 90 (d) 84

44. What is the ratio between the HCF and LCM of the numbers whose LCM is 48 and the product of the numbers is 384?
SSC CGL 01/12/2022 (Shift-02)
(a) 1 : 4 (b) 1 : 6
(c) 1 : 3 (d) 2 : 5

45. Choose the correct statement from the following.
SSC CGL 06/12/2022 (Shift-02)
(a) HCF is the least common multiple of the given numbers
(b) HCF of two or more numbers is the highest number which perfectly divides all the given numbers.
(c) HCF is also called the least common divisor
(d) In prime factorization method of HCF, the multiples of all the given numbers are listed

46. The HCF of two 2-digit number is 19 and their sum is 152. What is their difference?
SSC MTS 02/10/2021 (Shift-03)
(a) 19 (b) 38
(c) 57 (d) 76

47. The sum of two positive numbers is 240 and then HCF is 15. Find the number of pairs of number of satisfying the given condition.
SSC CGL Tier II 18/11/2020
(a) 4 (b) 8
(c) 2 (d) 5

48. The product of two numbers is 1500 and their HCF is 10. The number of such possible pairs _____ is/are.
SSC CGL TIER-II 02/03/2023
(a) 1 (b) 3
(c) 4 (d) 2

◆ TYPE – IV ◆
APPLICATION OF L.C.M.

49. Find the least number divisible by 2, 3, 5, 6, 9 and 18, which is a perfect square.
SSC CGL 24/07/2023 (Shift-02)
(a) 900 (b) 400
(c) 144 (d) 3600

50. What is the smallest perfect square number which is completely divisible by 4, 6, 9, 12 and 15?
SSC CPO 04/10/2023 (Shift-3)
(a) 900 (b) 961
(c) 784 (d) 841

51. Find the least number which is exactly divisible by 20, 28, 34, 60 and 75.
SSC CPO 05/10/2023 (Shift-01)
(a) 34500 (b) 35900
(c) 35700 (d) 36220

52. Six bells begin to toll together and toll, respectively, at intervals of 3,4,6,7,8 and 12 seconds. After how many seconds, will they toll together again?
SSC CGL 12/04/2022 (Shift - 02)
(a) 167 (b) 168
(c) 176 (d) 186

53. Six bells commence tolling together at 7 : 59 am. They toll at intervals of 3, 6, 9, 12 and 15 seconds respectively. How many time will they toll together till 8:16 am? (excluding the toll at 7:59 am)
SSC MTS 25/07/2022 (Shift-03)
(a) 5 (b) 6
(c) 3 (d) 4

54. The least number which is exactly divisible by 5, 6, 8, 10 and 12 is:
SSC CPO 23/11/2020 (Shift-02)
(a) 180 (b) 150
(c) 240 (d) 120

55. Five bells ring together at the intervals of 3, 5, 8, 9 and 10 seconds. All the bells ring simultaneously at the same time. The will again ring simultaneously after ....
SSC CPO 25/11/2020 (Shift-02)
(a) 8 minutes (b) 9 minutes
(c) 4 minutes (d) 6 minutes

56. What is the smallest multiple of 7, which when divided by 8, 9, 12 and 15 leaves a remainder of 5 in each case?

SSC CGL 12/04/2022 (Shift-01)

(a) 365 (b) 1085
(c) 2525 (d) 725

57. Find the smallest natural number 'x' which must be subtracted from 1800 so that $(1800 - x)$ is divided by 7, 11 and 23 leaving a remainder of 5 in each case.

SSC MTS 26/07/2022 (Shift-03)

(a) 24 (b) 25
(c) 26 (d) 20

58. The largest number of four digits that is exactly divisible by 17 and 36 is:

SSC CPO 03/10/2023 (Shift-01)

(a) 8568 (b) 9180
(c) 9792 (d) 7958

59. The least number which should be added to 1351 so that the sum is exactly divisible by 2,4,6 and 8 is:

SSC CPO 03/10/2023 (Shift-03)

(a) 13 (b) 11
(c) 15 (d) 17

60. What is the greatest six digits number which when divided by each of 16, 24, 72 and 84, leaves the remainder 15?

SSC CPO 10/11/2022 (Shift-03)

(a) 999981 (b) 999951
(c) 999963 (d) 999915

61. What is the largest four digit number which when divided by 6, 7 and 8 leaves remainder 4, 5 and 6 respectively?

SSC CGL 18/04/2022 (Shift-02)

(a) 9910 (b) 9920
(c) 9921 (d) 9912

62. What is the least number when divided by 15, 18 and 36 leaves the same remainder 9 in each case and is divisible by 11?

SSC CPO 23/11/2020 (Shift-01)

(a) 1269 (b) 1089
(c) 1080 (d) 1071

63. There is a circular path around a sports field. Rahul takes 15 minutes to drive one round of the field, while Anil takes 18 minutes for the same. Suppose they both start from the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?

SSC MTS 11/05/2023 (Shift-01)

(a) 120 (b) 100
(c) 80 (d) 90

64. The traffic lights at 3 different road crossings change after every 48 sec, 72 sec and 108 sec, respectively. If they all change simultaneously at 8:20 a.m., then at what time will they next change again simultaneously?

SSC MTS 07/07/2022 (Shift-01)

(a) 8:27:12 a.m. (b) 8:33:32 a.m.
(c) 9:12:18 am. (d) 8:40:14 a.m.

65. Four runners start running together from a point on a circular track. They took 400 seconds, 600 seconds, 720 seconds and 900 seconds to complete one round. After how much time did they meet at the starting point for the first time after the start of the race?

SSC CHSL 03/06/2022 (Shift-01)

(a) 4200 sec. (b) 2400 sec.
(c) 3600 sec. (d) 1800 sec.

• TYPE – V •
APPLICATION OF H.C.F.

66. The greatest number that divides 126, 224 and 608 leaving remainders 2, 7 and 19 respectively, is:

SSC CGL 18/04/2022 (Shift-01)

(a) 31 (b) 27
(c) 21 (d) 37

67. What is the greatest positive integer that divides 554, 714 and 213 leaving the remainder 43, 57 and 67, respectively?

SSC CPO 10/11/2022 (Shift-02)

(a) 95 (b) 71
(c) 83 (d) 73

68. Find the greatest possible length (in meters) that can be used to exactly measure the lengths 6 m, 5 m 25 cm and 12 m 50 cm.

SSC CPO 03/10/2023 (Shift-02)

(a) 0.35m (b) 0.90 m
(c) 0.75 m (d) 0.25 m

69. The greatest possible length that can be used to measure exactly the lengths of 3 m 15 cm, 5 m, and 6 m 85 cm is:

SSC CPO 05/10/2023 (Shift-02)

(a) 11 cm (b) 7 cm
(c) 9 cm (d) 5 cm

70. Two tankers contain 850 liters and 680 liters of oil. Find the maximum capacity of a container which can measure the maximum oil of both tankers when used, an exact number of times.

SSC MTS 06/09/2023 (Shift- 02)

(a) 425 liters (b) 680 liters
(c) 170 liters (d) 340 liters

71. Two wires of length 10 m 54 cm and 11m 56 cm are cut into pieces of length cm, x is an integer. Then find maximum value of x.

SSC MTS 21/07/2022 (Shift-03)

(a) 42 (b) 56
(c) 34 (d) 28

72. A person has three iron bars whose lengths are 20, 30 and 40 meters, respectively. He wants to cut pieces of the same length from each of the three bars. What is the least number of total pieces if he cuts without any wastage?

SSC CPO 04/10/2023 (Shift-02)

(a) 9 (b) 10
(c) 8 (d) 11

73. The least number of square tiles required to pave the ceiling of a room, 12m 95cm long and 3m 85 cm broad, is:

SSC MTS 11/10/2021 (Shift-02)

(a) 417 (b) 517
(c) 407 (d) 507

• TYPE – VI •
MISCELLANEOUS QUESTIONS

74. A milk vendor has 75 litres of cow milk, 45 litres of toned milk and 30 litres of full cream milk. These should be placed in different trays such that each tray contains the same quantity of milk and two kinds of milk should not be mixed in a tray. What is the least number of trays required to place all the milk?

SSC CHSL TIER-II (18/11/2024

(a) 20 (b) 25
(c) 10 (d) 15

75. Three numbers are co-prime to each other such that that product of the first two numbers is 88 and that of the last two number is 165. The sum of all three numbers is :

SSC MTS 27/10/2021 (Shift-0

(a) 44 (b) 35
(c) 36 (d) 34

76. The HCF and the LCM of two numbers are 5 and 120, respectively. If the sum of the two numbers is 55, then the sum of the reciprocals of these two numbers is equal to:

SSC MTS 05/07/2022 (Shift-0

(a) $\frac{55}{601}$ (b) $\frac{11}{120}$
(c) $\frac{120}{11}$ (d) $\frac{601}{55}$

77. The sum of two numbers is 18 and their HCF and LCM are 3 and 54 respectively. What will be the sum of their reciprocals?

SSC CGL 06/12/2022 (Shift-0

(a) $\frac{1}{7}$ (b) $\frac{1}{11}$
(c) $\frac{1}{6}$ (d) $\frac{1}{9}$

78. If the sum of two numbers is 60 and their HCF and LCM are 5 and 60 respectively, then the sum of the reciprocals of the numbers will be:

SSC CPO 05/10/2023 (Shift-0

(a) $\frac{1}{4}$ (b) $\frac{1}{5}$
(c) $\frac{1}{11}$ (d) $\frac{1}{6}$

79. In finding the HCF of two numbers by division method, the last divisor is 17 and the quotients are 1, 11 and 2, respectively. What is sum of the two numbers?

SSC CGL Tier II 13/09/2019

(a) 833 (b) 867
(c) 816 (d) 901

80. The LCM of two prime numbers x and y $(x > y)$ is 533. The value of $4y - x$ is:

SSC CPO 03/10/2023 (Shift-0

(a) 11 (b) 21
(c) 18 (d) 23

81. If the HCF of 45 and 55 is expressible in the form of 55 × 5 + 45m, then what is the value of m?

SSC CPO 04/10/2023 (Shift-0

(a) 5 (b) – 6
(c) –5 (d) 6

82. If the LCM and the HCF of two numbers are 12 and 2 respectively, then find the mean proportional of these numbers.

SSC CGL 17/07/2023 (Shift-01)

(a) $2\sqrt{6}$ (b) $\sqrt{14}$

(c) 2 (d) $\sqrt{6}$

83. A and B are two prime numbers such that A>B and their LCM is 209. The value of $A^2 - B$ is:

SSC CGL 12/04/2022 (Shift-03)

(a) 350

(b) 372

(c) 361

(d) 339

84. 13, a, b, c are four distinct numbers and the HCF of each pair of numbers (13, a) ; (13, b); (13, c) is 13, where a,b,c are each less than 60 and a < b < c. What is the value of $\frac{a+c}{b}$?

SSC CGL 13/04/2022 (Shift-01)

(a) 3.5 (b) 2

(c) 5 (d) 4.5

ANSWER KEY

1.	(b)	2.	(b)	3.	(b)	4.	(b)	5.	(d)	6.	(a)	7.	(b)	8.	(b)	9.	(b)	10.	(c)
11.	(b)	12.	(a)	13.	(b)	14.	(b)	15.	(a)	16.	(a)	17.	(a)	18.	(a)	19.	(a)	20.	(b)
21.	(b)	22.	(c)	23.	(a)	24.	(b)	25.	(d)	26.	(d)	27.	(c)	28.	(a)	29.	(d)	30.	(d)
31.	(c)	32.	(d)	33.	(d)	34.	(c)	35.	(a)	36.	(d)	37.	(d)	38.	(b)	39.	(d)	40.	(a)
41.	(d)	42.	(c)	43.	(c)	44.	(b)	45.	(b)	46.	(b)	47.	(a)	48.	(d)	49.	(a)	50.	(a)
51.	(c)	52.	(b)	53.	(a)	54.	(d)	55.	(d)	56.	(b)	57.	(a)	58.	(c)	59.	(d)	60.	(b)
61.	(a)	62.	(b)	63.	(d)	64.	(a)	65.	(c)	66.	(a)	67.	(d)	68.	(d)	69.	(d)	70.	(c)
71.	(c)	72.	(a)	73.	(c)	74.	(c)	75.	(d)	76.	(b)	77.	(d)	78.	(b)	79.	(c)	80.	(a)
81.	(b)	82.	(a)	83.	(a)	84.	(b)												

SOLUTIONS

1. (b) Prime Factorization of
$144 = 2^4 \times 3^2$
$360 = 2^3 \times 3^2 \times 5$
$450 = 2 \times 3^2 \times 5^2$
LCM (144, 360, 450)
$= 2^4 \times 3^2 \times 5^2 = 3600$

2. (b) Prime Factorization of
$105 = 3 \times 5 \times 7$
$335 = 5 \times 67$
$465 = 3 \times 5 \times 31$
HCF (105, 335, 465) = 5

Alternate Method:

105 335 465

130

⑤ × 26
2 × 65

5 will be the HCF.

3. (b) Prime Factorization of
$1026 = 2 \times 3 \times 9 \times 19$
$= 2 \times 3^3 \times 19$
$2268 = 2^2 \times 3^4 \times 7$
$2430 = 2 \times 3^5 \times 5$
$\therefore$ HCF $= 2 \times 3^3 = 54$

Alternate Method:

2430 2268

162
54 × 3
81 × 2
27 × 6

All number 1026, 2268 & 2430 are multiple of 54.

4. (b) LCM of 48 and 64 = 192
HCF of 12 and 18 = 6
ATQ,
$\because$ LCM of 48 and 64 = m × HCF of 12 and 18
$\Rightarrow 192 = m \times 6$
$\Rightarrow m = \frac{192}{6}$
$\Rightarrow m = 32$

5. (d) HCF of (108, 72) = 36
$\therefore 5a = 5 \times 36 = 180$
Now, Prime Factorization of
$108 = 2 \times 2 \times 3 \times 3 \times 3$
$72 = 2 \times 2 \times 2 \times 3 \times 3$
$36 = 2 \times 2 \times 3 \times 3$
LCM $= 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 216$

6. (a) $P = 2^8 \times 3^5, Q = 2^3 \times 3^4, R = 3^5 \times 2^7$
HCF of P, Q and R $= 2^3 \times 3^4$

7. (b) LCM of $2^3 \times 9^2 \times 13, 2^2 \times 13^2 \times 19, 9^3 \times 13^3 \times 19^2 = 2^3 \times 9^3 \times 13^3 \times 19^2$

8. (b) $\text{LCM}\left(\frac{3}{8}, \frac{5}{16}, \frac{7}{2}\right)$
$= \frac{\text{LCM}(3,5,7)}{\text{HCF}(8,16,2)} = \frac{105}{2} = 52\frac{1}{2}$

9. (b) $\text{HCF}\left(\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}\right)$
$= \frac{\text{HCF}(1, 3, 5, 7)}{\text{LCM}(2, 4, 6, 8)} = \frac{1}{24}$

10. (c) $\text{HCF}\left(\frac{12}{5}, \frac{14}{15}, \frac{16}{17}\right)$
$= \frac{\text{HCF}(12, 14, 16)}{\text{LCM}(5, 15, 17)} = \frac{2}{255}$

11. (b) LCM (0.15, 0.18 and 0.45)
$= \text{LCM}\left(\frac{15}{100}, \frac{18}{100}, \frac{45}{100}\right)$
$= \frac{\text{LCM}(15,18,45)}{\text{HCF}(100,100,100)}$
$= \frac{3 \times 5 \times 2 \times 3}{100} = \frac{90}{100} = 0.9$

12. (a) $\text{LCM}\left(\frac{1866}{10}, \frac{3732}{10}\right)$
$= \frac{\text{LCM}(1866,3732)}{\text{HCF}(10, 10)} = \frac{3732}{10}$
$= 373.2$

13. (b) LCM of (0.126, 0.36, 0.96)
$= \frac{\text{LCM}(126,36,96)}{\text{HCF}(1000,100,100)}$
Prime factorization of
$126 = 7 \times 3^2 \times 2$
$36 = 3^2 \times 2^2$
$\Rightarrow 96 = 2^5 \times 3$
$\therefore$ LCM $= 2^5 \times 3^2 \times 7 = 2016$
HCF of 1000, 100, 100 = 100
$\therefore$ Required LCM $= \frac{2016}{100} = 20.16$

14. (b) $x^2 - 8x + 15 = x^2 - 3x - 5x + 15$
$= x(x-3) - 5(x-3)$
$= (x-5)(x-3)$
$x^2 - 5x + 6 = x^2 - 3x - 2x + 6$
$= x(x-3) - 2(x-3) = (x-2)(x-3)$
$\therefore$ LCM $= (x-3)(x-2)(x-5)$

15. (a) HCF $[(x^6 + 1), (x^4 - 1)]$
$x^6 + 1 = (x^2 + 1)[x^4 + 1 - x^2]$
$x^4 - 1 = (x^2 - 1)(x^2 + 1)$
$\therefore$ HCF $= (x^2 + 1)$

Alternate Method:
Put $x = 2$
$x^6 + 1 = 2^6 + 1 = 65$,
$x^4 - 1 = 16 - 1 = 15$
HCF of 65, 15 = 5
Go through options,
$1 + x^2 = 1 + 2^2 = 5$

16. (a) HCF $(x, y) = 15$
$\Rightarrow x = 15a, y = 15b$
$36x^2 - 81y^2 = (6x)^2 - (9y)^2$
$= (6 \times 15a)^2 - (9 \times 15b)^2$
$= (45)^2 [4a^2 - 9b^2]$
$81x^2 - 9y^2 = (9x)^2 - (3y)^2$
$= (9 \times 15a)^2 - (3 \times 15b)^2$
$= (45)^2 [9a^2 - b^2]$
HCF = $(45)^2$, which is divisible by 135

Alternate Method:
$9(4x^2 - 9y^2), 9(9x^2 - y^2)$
Here 9 is the common factor and 15 is the HCF of x, y so from the given equation we can take the common factor 9 × 15 = 135

17. (a) $8x^3 + 80x^2 + 200x = 8x(x^2 + 10x + 25)$
$= 8x(x + 5)(x + 5)$
$4x^4 + 16x^3 - 20x^2 = 4x^2(x^2 + 4x - 5)$
$= 4x^2(x - 1)(x + 5)$
$\therefore$ LCM $= 8x^2(x + 5)^2(x - 1)$

18. (a) $\because (x^3 - 8) = (x - 2)(x^2 + 4 + 2x)$
$(x^3 - 6x^2 + 12x - 8) = (x - 2)^3$
$(x^3 - 4x^2 + 4x) = x(x - 2)^2$
$\therefore$ HCF $= (x - 2)$

19. (a) HCF $(xy^3, x^2y, x^3y^4) = xy$
LCM $= x^3y^4$

20. (b) $a^3b - ab^3 = ab(a^2 - b^2)$
$a^3b^2 - a^2b^3 = a^2b^2(a - b)$
$ab(a - b) = ab(a - b)$
LCM $= a^2b^2(a^2 - b^2)$

21. (b) We know,
$N_1 \times N_2 =$ LCM × HCF
$\Rightarrow 3x \times 8x = 120 \times x$
$\Rightarrow \quad x = 5$
$\therefore N_1 + N_2 = 5(3 + 8) = 55$

> **SMART APPROACH:-**
> Sum of the numbers must be divisible by 11, since sum of ratio is 11.
> Only option (b) satisfied.

22. (c) I : II : III = $5x : 7x : 9x$
LCM = 1260
HCF × I × II × III = 1260
$\Rightarrow x \times 5 \times 7 \times 9 = 1260$
$\Rightarrow \boxed{x = 4}$
$\therefore$ Difference between the largest and the smallest number $= 9x - 5x$
$= 4x = 4 \times 4 = 16$

23. (a) Let, the numbers are $5x$, $7x$ & $9x$
LCM = 34650
$5 \times 7 \times 9 \times x = 34650 \Rightarrow x = 110$
$\therefore$ HCF = 110

24. (b) The two numbers are
17 × 11 = 187 & 17 × 19 = 323
$\therefore$ 187 is smaller number

25. (d) 2 × 3 × 5 × HCF = 90
$\Rightarrow$ HCF = 3

26. (d) A : B : C
$[\frac{1}{2} \quad \frac{2}{3} \quad \frac{3}{4} \quad \times 12$
$6 : 8 : 9$
3 unit = 33
1 unit = 11
$\therefore$ HCF = 11

Alternate Method:
HCF is the factor of difference of largest and smallest number only option (d) 11 is the factor of 33.

27. (c) Ratio = 7 : 11, HCF = 28
Difference = (11 − 7) × 28
= 4 × 28 = 112

28. (a) LCM (a, b) = 42
$\therefore$ LCM of 5a and 11b
= 11 × 5 × (LCM of a and b)
= 55 × 42 = 2310

29. (d) We know,
$N_1 \times N_2 =$ HCF × LCM
$\Rightarrow 49 \times N_2 = 840 \times 21 \Rightarrow N_2 = 360$
Note: Question is conceptually wrong because 21 can not be the H.C.F. of 49 and 360.

30. (d) We know, $N_1 \times N_2 =$ LCM × HCF
$\Rightarrow 171 \times N_2 = 4104 \times 9$
$\Rightarrow N_2 = \frac{4104 \times 9}{171} = 216$

> **SMART APPROACH:-**
> As we know, HCF is highest common factor in two or more numbers. Thus, second number must be multiple of 9.
> Only option (d) satisfied.

31. (c) LCM × HCF = Product of two numbers
$\Rightarrow$ LCM × 11 = 726 $\Rightarrow$ LCM = 66

32. (d) We know,
Product of numbers = LCM × HCF
$\Rightarrow x \times y = 441 \times 7$
$\Rightarrow 49 \times y = 3087 \Rightarrow y = \frac{3087}{49}$
$\Rightarrow y = 63$

33. (d)) A number which is divisible only by itself and 1 is called a prime number
HCF $(K_1, K_2) = 1$
LCM $(K_1, K_2) = K_1 \times K_2$
$\therefore$ Product of LCM and HCF
$= K_1 \times K_2$

34. (c) HCF (m, n) = a
n = ab
Let, m = ac
LCM (m, n) = (ab, ac)
= abc = (ac)b = bm

35. (a) $\because$ LCM of p and q = r
LCM of p^2q and $pq^2 = p^2q^2 = (pq)^2$
$(\because pq = r)$
$= pq \times pq = pq \times r = pqr$

36. (d) LCM + HCF = 512 ….(i)
LCM − HCF = 496 ….(ii)
Adding equation (i) and (ii)
LCM = 504
$\therefore$ HCF = 8
We know that,
LCM × HCF = first no. × second no.
$\Rightarrow$ 504 × 8 = 72 × second no.
$\Rightarrow$ Second number = 56

37. (d) LCM = 21 × 221
Let, Number = $21x$ & $21y$
We know that,
First no. × Second no. = LCM × HCF
$\Rightarrow (21 \times 221) \times 21 = 21x \times 21y$
$\Rightarrow xy = 221 = (13 \times 17)$
$\therefore x = 17 \times 21 = 357$,
$y = 13 \times 21 = 273$
$\therefore$ Sum of number = (3 + 5 + 7) = 15

38. (b) Let LCM = 20 units then HCF = 1 unit
ATQ,
Difference (19 units) = 456
$\Rightarrow$ 1 unit = 24
Now,
LCM × HCF = First number × second number
$\Rightarrow$ (20 × 24) × (1 × 24) = 96 × second number
$\Rightarrow$ Second number
$= \frac{(20 \times 24) \times (1 \times 24)}{96} = 120$

39. (d) Given,
LCM = 56 × HCF …..(i)
HCF + LCM = 1710 …..(ii)
From (i) and (ii)
HCF + 56 HCF = 1710
$\Rightarrow$ 57 HCF = 1710
$\Rightarrow \text{HCF} = \frac{1710}{57} = 30$
$\therefore$ LCM = 56 × 30
We know that,
A × B = HCF × LCM
$\Rightarrow$ 240 × B = 30 × 30 × 56
$\Rightarrow$ B = 210

40. (a) LCM = 22 × HCF
LCM + HCF = 276 (Given)
$\Rightarrow$ 22 HCF + HCF = 276
$\Rightarrow$ HCF = 12
$\therefore$ LCM = 22 × 12 = 264
We know that,
I × II = HCF × LCM
$\Rightarrow$ 132 × II = 12 × 264
$\Rightarrow \text{II} = \frac{12 \times 264}{132} = 24$

41. (d) HCF = 12
LCM = 12 × 204
A : B = a : a + 60
We know that,
HCF × LCM = A × B
$\Rightarrow 12 \times 12 \times 204 = a \times (a + 60)$
$\Rightarrow 144 \times 204 = a(a + 60)$
Then,
a = 144 and a + 60 = 204
$\therefore$ A + B = 204 + 144 = 348

42. (c) We know that, LCM is always multiple of HCF.
Here, HCF = 8
In the given options, 42 is not multiple 8.

43. (c) LCM is always divisible by HCF
Here, HCF = 12
In given options multiple of 12 are 60, 72, 84.
In the given options 90 is not multiple 12.

44. (b) We know, $N_1 \times N_2 = HCF \times LCM$

$\Rightarrow 384 = HCF \times 48$

$\Rightarrow HCF = \frac{384}{48} = 8$

$\therefore \frac{HCF}{LCM} = \frac{8}{48} = \frac{1}{6}$

45. (b) HCF of two or more numbers is the highest no. which perfectly divide all the given no.

46. (b) Let, two no's are $19x$ and $19y$

$19x + 19y = 152$ (Given)

$\Rightarrow x + y = 8$

Possible pairs = (1, 7) (3,5)

With (1,7) one no. is of three digit.

So take (3,5)

No's = 57 and 95

Difference = 95 – 57 = 38

47. (a) Let, the no. be = a : b

HCF = 15 (Given)

Numbers = 15a, 15b

∴ 15a + 15b = 240

⇒ a + b = 16

Possible pairs = (1, 15), (3, 13), (5, 11), (7, 9)

Total 4 pairs are possible.

48. (d) Let the numbers be $10x$ and $10y$.

Then, $10x \times 10y = 1500 \Rightarrow xy = 15$

The possible values of x and y

= (1, 15) and (3, 5)

There are only 2 such possible pairs

49. (a) LCM(2,3,5,6,9,18) = 90

Least perfect square = 90 × 10 = 900

50. (a) LCM (4, 6, 9, 12, 15) = 180

∴ 180 × 5 = 900 is smallest perfect square number

Alternate Method:

only option (a) is divisible by 9

51. (c) LCM (20, 28, 34, 60, 75)

$= 2^2 \times 5 \times 7 \times 17 \times 3 \times 5 = 35700$

Alternate Method:

Prime Factorization of

20 = 2 × 2 × 5

28 = 2 × 2 × 7

34 = 2 × 17

60 = 2 × 2 × 3 × 5

75 = 3 × 5 × 5

$L.C.M = 2^2 \times 5 \times 7 \times 3 \times 17 \times 5$

= 35700

52. (b) LCM (3, 4, 6, 7, 8, 12) = 168

They will toll again after 168 Seconds.

SMART APPROACH:-

Option must be divisible by 3 and 7,

Only option (b) satisfied.

53. (a) LCM (3, 6, 9, 12, 15) = 180

⇒ The bells together toll after every

180 sec. or $\frac{180}{60} = 3$ minutes.

From 7:59 am to 8:16 am, there is total 17 minutes gap

No. of times bells tolling = $\frac{17}{3} = 5$

54. (d) LCM (5, 6, 8, 10, 12) = 120

55. (d) LCM (3, 5, 8, 9, 10)

= 360 seconds = 6 minutes

After 6 minutes all the five bells ring together.

56. (b) LCM of (8, 9, 12, 15) = 360

So, number = 360k + 5 which is divisible by 7.

Put k = 3,

Required number = 360 × 3 + 5

= 1080 + 5 = 1085

SMART APPROACH:-

Check by option whether any number is divisible by 7 or not.

57. (a) LCM (7, 11, 23) = 1771

In each case, remainder = 5

Required number = 1771 + 5

= 1776

$\therefore x = 1800 - 1776 = 24$

58. (c) Since 36 and 17 are co-prime numbers

∴ LCM (17, 36) = 36 × 17 = 612

Largest four digits no. = 9999

and 9999 = 612 × 16 + 207

∴ Required number = 9999 – 207

= 9792

59. (d) LCM (2, 4, 6, 8) = 24

1351 = 24 × 57 – 17

∴ Required number that should be added to 1351 to make it exactly divisible by 24 is '17'.

Alternate Method:

LCM of [2, 4, 6, 8] = 24

The sum should be exactly divisible by 24.

So go through option (d),

$\frac{1351 + 17}{24} = \frac{1368}{24} = 57$

(Completely divisible)

∴ Least number be 17 which should be added to 1351.

60. (b) LCM of 16, 24, 72 & 84 = 1008

999999 = 1008 × 992 + 63

Largest 6 digit number which is divisible by 1008

= 999999 – 63 = 999936

∴ Required Number

= 999936 + 15 = 999951

SMART APPROACH:-

We can directly check by divisibility of 4, 8 and 9

∴ 999951-15 = 999936

Only option (b) is correct.

61. (a) LCM (6, 7 and 8) = 168

and (6 – 4) = (7 – 5) = (8 – 6) = 2

Largest four digit number = 9999

9999 = 168 × 59 + 87

Required number = (9999 – 87) – 2

= 9910

Alternate Method:

When the number is divided by 6 leaves remainder 4 it means when the same number is divided by 3 leaves remainder 1 only option (a) satisfied.

62. (b) LCM of 15, 18, 36 = 180

Number = 180 × k + 9

Put k = 6

∴ No. = 180 × 6 + 9 = 1089

Alternate Method:

In option subtract 9 and divide by 15, 18, 36

SMART APPROACH:-

In the given options, only 1089 is completely divisible by 11

Hence, options (b) is correct

63. (d) LCM (15, 18) = 90 min

∴ They will meet after 90 min of starting.

64. (a) L.C.M of (48, 72, 108) = 432

Light will change together after every 432 Second or

$\frac{432}{60} = 7$ min 12 Sec

Time = (8 : 20m + 7 min 12 Sec.)

= 8 : 27 : 12 am

65. (c) The first time all of them meet while running on a circular track = LCM of (400, 600, 720, 900)

Prime factorization of

$400 = 2^4 \times 5^2$, 600

$= 2^3 \times 3 \times 5^2$

$720 = 2^4 \times 3^2 \times 5$, 900

$= 3^2 \times 5^2 \times 2^2$

So, $LCM = 2^4 \times 3^2 \times 5^2$

= 3600 sec

66. (a) Required no.

= HCF of (126 – 2), (224 – 7), and (608 – 19)

= HCF of (124, 217 and 589)

Prime Factorization of

124 = 31 × 4

217 = 31 × 7

589 = 31 × 19

∴ HCF = 31

Alternate Method:

Required No. = HFC of (126 – 2) (224 – 7)(608 – 19)

HCF of (124, 217, 589)

93

㉛ × 3

∴ HCF = 31

67. (d) HCF of (554 – 43, 714 – 57, 213 – 67) = HCF of (511, 657, 146)

Now, prime Factorization of

511 = 7 × 73

657 = 3 × 3 × 73

146 = 2 × 73

∴ HCF = 73

68. (d) HCF (6, 5.25, 12.50)

$= HCF\left(\frac{600}{100}, \frac{525}{100}, \frac{1250}{100}\right)$

$= \frac{HCF(600, 525, 1250)}{LCM(100, 100, 100)}$

Prime Factorization of

600 = 25 × 24

525 = 25 × 21

1250 = 25 × 50

$\therefore HCF = \frac{25}{100} = 0.25$ m

69. (d) Prime Factorization of

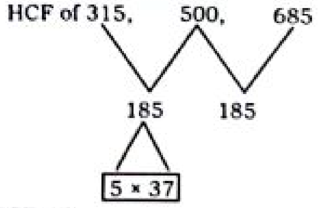
$315 = 3^2 \times 5 \times 7$

$500 = 2^2 \times 5^3$

685 = 5 × 137

∴ HCF (315, 500, 685) = 5 cm

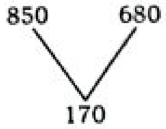
Alternate Method:



HCF = 5

70. (c) Prime Factorization of
$850 = 5 \times 170$
$680 = 4 \times 170$
H.C.F = 170
∴ Maximum capacity of tankers
= 170 liters.

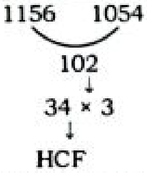
Alternate Method:



HCF = 170

71. (c) Length of wires = 1054 cm and 1156 cm
Prime Factorization of
$1054 = 2 \times 17 \times 31$
$1156 = 2^2 \times 17^2$
∴ HCF (x) = 34

Alternate Method:



72. (a) HCF (20, 30, 40) = 10
Least number of such bars
$= \frac{20}{10} + \frac{30}{10} + \frac{40}{10}$
$= 2 + 3 + 4 = 9$

73. (c) HCF (12m 95 cm, 3m 85 cm)
= HCF (1295 cm, 385 cm)
Prime factorization of
$1295 = 5 \times 7 \times 37$
$385 = 5 \times 7 \times 11$
Side of square tiles = 35
∴ Required no of tiles
$= \frac{1295 \times 385}{35 \times 35} = 407$

SMART APPROACH:-
No need to solve 37 × 11
It can be solved by digital sum.
Option (c) is correct

74. (c) HCF of 75, 45, 30 = 15
Least no. of trays required
$= \frac{75}{15} + \frac{45}{15} + \frac{30}{15}$
$= 5 + 3 + 2 = 10$

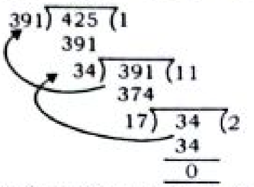
75. (d) HCF of 88 and 165 = 11
First number $= \frac{88}{11} = 8$
3rd number $= \frac{165}{11} = 15$
2nd number = 11
Sum of all number = 8 + 11 + 15 = 34

76. (b) Let two numbers be A and B
$\Rightarrow A \times B = HCF \times LCM$
$\Rightarrow A \times B = 5 \times 120 = 600$
Also,
$A + B = 55$
$\therefore \frac{1}{A} + \frac{1}{B} = \frac{B + A}{AB} = \frac{55}{600} = \frac{11}{120}$

77. (d) $N_1 + N_2 = 18$
$N_1 \times N_2 = 54 \times 3 = 162$
$\therefore \frac{1}{N_1} + \frac{1}{N_2} = \frac{N_1 + N_2}{N_1 N_2} = \frac{18}{162} = \frac{1}{9}$

78. (b) $A + B = 60$ ....(i)
HCF = 5
LCM = 60
$\therefore A \times B = 5 \times 60 = 300$ ....(ii)
From equation (i) and (ii)
$\therefore \frac{1}{A} + \frac{1}{B} = \frac{B + A}{AB} = \frac{60}{300} = \frac{1}{5}$

79. (c)



Sum of number = 391 + 425 = 816

80. (a) LCM (x, y) = 533
since, HCF (x, y) = 1
$x \times y = 533 = 13 \times 41$
$\therefore x = 41, y = 13$
$\therefore 4y - x = 13 \times 4 - 41 = 52 - 41 = 11$

81. (b) HCF (45, 55) = 5
ATQ,
$5 = 55 \times 5 + 45m$
$\Rightarrow 5 = 275 + 45m$
$\Rightarrow 45m = -270 \Rightarrow m = -6$

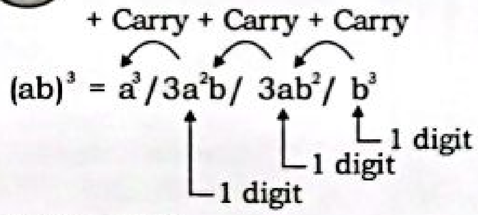
82. (a) LCM × HCF = Ist no. × IInd no.
⇒ Ist no. × IInd no. = 12 × 2 = 24
∴ Mean Proportion $= \sqrt{24} = 2\sqrt{6}$

83. (a) Prime factors of 209 = 11 × 19
So, A = 19 and B = 11 [∵ A > B]
$\therefore A^2 - B = 19^2 - 11 = 361 - 11 = 350$

84. (b) a, b, c should be multiple of 13, as the HCF is 13
The HCF of 13 and a = 13 ⇒ a = 26
The HCF of 13 and b = 13 ⇒ b = 39
The HCF of 13 and c = 13 ⇒ c = 52
Here, a < b < c < 60
$\therefore \frac{(a + c)}{b} = \frac{(26 + 52)}{39} = \frac{78}{39} = 2$

SPEED BOOSTER HACKS

◆ Cube of two Digits Number ◆



$(ab)^3 = a^3/3a^2b/\ 3ab^2/\ b^3$

- **Cube of 14**

Here, a = 1 & b = 4
$14^3 = 1^3/3.1^2.4/3.1.4^2/4^3 = 1/12/48/64 = 2744$

- **Cube of 23**

Here, a = 2 & b = 3
$23^3 = 2^3/3.2^2.3/3.2.3^2/3^3 = 8/36/54/27 = 12167$

◆ Do it Yourself ◆

(i) 18^3 = ... (ii) 23^3 = ...
(iii) 29^3 = ... (iv) 33^3 = ...
(v) 38^3 = ... (vi) 43^3 = ...
(vii) 56^3 = ... (viii) 63^3 = ...
(ix) 69^3 = ... (x) 73^3 = ...
(xi) 77^3 = ... (xii) 82^3 = ...
(xiii) 87^3 = ... (xiv) 91^3 = ...

20
Chapter

SIMPLIFICATION

• TYPE – I •
BASED ON BODMAS RULE

1. Simplify
25 – (18 – 4 × 9 ÷ 3)
SSC CGL 23/09/2024 (Shift-02)
(a) –31 (b) 33
(c) –17 (d) 19

2. Simplify
626 × 2912 ÷ 8138
SSC CGL 26/09/2024 (Shift-03)
(a) 285 (b) 224
(c) 364 (d) 310

3. Simplify the following expression.
4 × 7 – 3 {7 × 4 ÷ (6 × 2)}
SSC CHSL 08/07/2024 (Shift-01)
(a) 4 (b) 12
(c) 21 (d) 19

4. Simplify: 18 ÷ (7 × 2 – 5) × 5 × 24 ÷ 30
SSC CHSL 02/07/2024 (Shift-01)
(a) 0.5 (b) 8
(c) 6 (d) 10

5. Simplify the following expression.
3 + 28 ÷ 35 × 15 + 4 – 3 × 4
SSC CHSL 01/07/2024 (Shift-01)
(a) 26 (b) 64
(c) 7 (d) 10

6. Simplify the given expression
25 ÷ 5 × 7 of (5 + 7) – 13 (6 × 4)
SSC CPO 27/06/2024 (Shift-01)
(a) 112 (b) 108
(c) 126 (d) 138

7. Find the simplified value of 5055 – (1002 ÷ 20.04).
SSC CPO 28/06/2024 (Shift-02)
(a) 4050 (b) 5005
(c) 50.05 (d) 5050

8. The value of 9 × 9 + 9 ÷ 9 – 9 × 9 + 9 ÷ 9 × 9 – 9 – 9 × 9 is:
SSC CPO 27/06/2024 (Shift-03)
(a) 9 (b) 1
(c) 81 (d) 0

9. The value of $(4^2)^2 + 4 \times 4 \div 4 - 4$ is:
SSC CPO 27/06/2024 (Shift-03)
(a) 4^4 (b) 4^3
(c) 4^2 (d) 4^0

10. Simplify the following:
21 – 4.9 ÷ 7 + 3.9 × 0.4 + 0.9
SSC CGL 09/09/2024 (Shift-02)
(a) 18.23 (b) 24.12
(c) 26.32 (d) 22.76

11. Simplify
21 – [6 + 7 – {3.22 – (1.1 × 0.2)}].
SSC CGL 10/09/2024 (Shift-02)
(a) 13 (b) 12
(c) 11 (d) 10

12. Simplify
15.5 – [3 – {7 – (5 – 14.5 + 13.5)}].
SSC CGL 12/09/2024 (Shift-01)
(a) 15.5 (b) 13.5
(c) 12.5 (d) 14.5

13. The value of
– 7 ÷ [5 + 1 ÷ 2 – {4 + (4 of 2 ÷ 4) + (4 ÷ 4 of 2)}]
SSC CPO 24/11/2020 (Shift-02)
(a) $-\frac{7}{2}$ (b) –7
(c) $\frac{7}{2}$ (d) 7

14. $7.5 \times 17.2 \div 8.6 + (59.5) \text{ of } \frac{1}{17} - \frac{7}{2} \text{ of } 5 = ?$
SSC CGL 20/07/2023 (Shift-02)
(a) 1 (b) 3
(c) 4 (d) 2

15. The value of 5 + 24 × 8 ÷ 8 of 8 – 8 ÷ 8 × 4 of 4 is equal to:
SSC CHSL TIER-II (18/11/2024)
(a) –8 (b) –9
(c) 8 (d) 9

16. Simplify:
13 – [7 – (4 + 7) – {7 – (7 – 4 + 7)} + 14]
SSC CGL 09/09/2024 (Shift-03)
(a) 13 (b) 9
(c) 0 (d) 26

17. The value of
15 ÷ 3 of 2 × 2 + 9 ÷ 18 of 2 × 4 – 4 ÷ 8 × 2
SSC CGL 10/09/2024 (Shift-01)
(a) 8 (b) 5
(c) $2\frac{3}{4}$ (d) $7\frac{3}{4}$

18. If 45 ÷ 3 + 4 × A – 48 ÷ 24 + 4 = 1, then the value of A is:
SSC CGL 10/09/2024 (Shift-03)
(a) –2 (b) 4
(c) 2 (d) –4

19. Simplify the following expression.
[{70 – 60 ÷ 2 of 6} + (20 – 10) ÷ 10] + 600 ÷ 25 of (2 × 3) × (2 of 3) ÷ 2 of 5.
SSC CGL 13/09/2024 (Shift-01)
(a) 90 (b) 100
(c) 99 (d) 110

20. Simplify the following
16 ÷ 2 – 7 × 15 ÷ 3 + 5 × 5 + 4 × 3 – 10
SSC CGL 13/09/2024 (Shift-03)
(a) 1 (b) 2
(c) 0 (d) –1

21. The value of 9 – 5 × 6 + {29 – (7 – 2)} ÷ 8 is:
SSC CGL 18/09/2024 (Shift-03)
(a) –8 (b) 18
(c) –18 (d) 8

22. Simplify the following expression.
25 ÷ 5 + 3 of 2 – 4 + 6 of 3 ÷ 2 – 8 + 4
SSC CGL 19/09/2024 (Shift-02)
(a) 16 (b) 4
(c) 8 (d) 12

23. The value of |15 ÷ 3 × 7 – 8 of 2 + 6| is
SSC CGL 19/09/2024 (Shift-03)
(a) 13 (b) 25
(c) –29 (d) 39.5

24. Simplify
6 × [28 ÷ 84 × {36 × 49 ÷ (6 × 7)}]
SSC CGL 23/09/2024 (Shift-01)
(a) 84 (b) 74
(c) 64 (d) 94

25. Simplify the following expression
0.07 × 0.28 ÷ 0.04 + 0.64 – 1.64 ÷ 0.04
SSC CGL 23/09/2024 (Shift-03)
(a) 38.56 (b) –39.87
(c) –46.48 (d) 36.78

26. Find the value of $11 - \{(3 + 4) \text{ of } 8 - \overline{4-8}\}$?
SSC CGL 24/09/2024 (Shift-01)
(a) 2 (b) 3
(c) 1 (d) –1

27. Simplify the following expression.
$133 \div 19 \times 3 - 48 \times 2 \div 24 + 841 \div \left[\left\{\overline{45-16}\right\}\right]$
SSC CGL 24/09/2024 (Shift-02)
(a) 46 (b) 21
(c) 12 (d) 42

28. Simplify:
[25 – 48 ÷ 6 + 12 × 2] + 78 – [5 + 3 of (25 – 2 × 10)]
SSC CGL 25/09/2024 (Shift-02)
(a) 98 (b) 90
(c) 99 (d) 89

29. The value of N in the equation 9 × N of 4 ÷ 4 – 15 × 4 = 12 is:

SSC CGL 25/09/2024 (Shift-03)

(a) 9 (b) 0
(c) 12 (d) 8

30. Simplify the following expression.
(60 + 64 ÷ 4 of 4) × [1000 ÷ {10 of (3 + 2) × 2 of 5}] – 28 + (100 × 3 of 3).

SSC CGL 26/09/2024 (Shift-02)

(a) 600 (b) 1000
(c) 100 (d) 500

31. Simplify the following expression.
[40 – 48 ÷ 4 of 3]÷{[6 + 4] – 4 of 4 + 4 + (6 – 4) + (4 × 4) ÷ 4} × 3.

SSC CHSL 02/07/2024 (Shift-03)

(a) 25 (b) 27
(c) 30 (d) 26

32. Simplify the given expression.
$8 - 5 \div 2^3 \times 3 + (7 \div 7 \times 7) \div 7 + (3 \times 6 \div \frac{1}{3}) \times \frac{1}{3^3}$

SSC CHSL 03/07/2024 (Shift-03)

(a) $\frac{73}{9}$ (b) $\frac{73}{21}$
(c) $\frac{73}{21}$ (d) $\frac{73}{8}$

33. If 640 ÷ 8 + 930 ÷ 15 – k + 32 × 5 = 1104 ÷ 16 × 148 ÷ 37, then the value of k is:

SSC CHSL 11/07/2024 (Shift-03)

(a) 276 (b) 26
(c) 35 (d) 302

34. The value of $[3^3\{(40 \times 5) + (7 \times 6)\} \div 11] + (2^3 \times 15 \div 24)$ is:

SSC CHSL 10/07/2024 (Shift-03)

(a) 599 (b) 559
(c) 595 (d) 959

35. Simplify the following:
12 ÷ 4 of 3 × 6 + 8 ÷ 16 of 4 × 8 – 4 ÷ 6 × 9

SSC CHSL 10/07/2024 (Shift-01)

(a) – 1 (b) 1
(c) $6\frac{1}{4}$ (d) 13

36. If '÷' means '×', '×' means '÷', '+' means '-', '-' means '+', then 47 ÷ (10 × 5) + (4 – 5) – 6 is:

SSC CHSL 10/07/2024 (Shift-04)

(a) 100 (b) 59
(c) 91 (d) 79

37. Simplify the following expression.
99 – [169 ÷ (13 × 13) – (–4) – {3 – 17 + 10}]

SSC CHSL 05/07/2024 (Shift-01)

(a) 90 (b) 87
(c) 107 (d) 80

38. Simplify the following expression.
(3 – 3 × 3 + 3 ÷ 3 + 3 × 5) × 2 of 5 + (2 + 2 ÷ 2 + 2 × 2 – 2)

SSC CHSL 02/07/2024 (Shift-02)

(a) 105 (b) 106
(c) 102 (d) 100

39. Evaluate the given expression.
(45 + 9) ÷ 2 – 7 × 33 ÷ 7 + {(7 + 18) × 6} + 9 × 8 – 89

SSC CHSL 09/07/2024 (Shift-03)

(a) 118 (b) 112
(c) 127 (d) 125

40. The value of (17 + 15) ÷ 2 – 11 + 16 × 4 – 28 + 13 (-16 + 13) is:

SSC CHSL 03/07/2024 (Shift-02)

(a) 1 (b) 2
(c) 0 (d) 3

41. If 42 ÷ 3 + k × 3 – 22 ÷ 11 + 4 = 28, then the value of k is:

SSC CHSL 10/07/2024 (Shift-03)

(a) 4 (b) 2
(c) 0 (d) 1

42. Simplify:
(36 ÷ 6) ÷ 3 + (18 ÷ 9) × 4 – (12 ÷ 6) × (5 + 2) =

SSC CHSL 01/07/2024 (Shift-03)

(a) 5 (b) 21
(c) 15 (d) 10

43. Simplify the expression 720 + 48 ÷ 8 × 5 – 6 × 3.

SSC CHSL 08/07/2024 (Shift-04)

(a) 732 (b) 242
(c) $\frac{112}{5}$ (d) 161

44. Simplify the following:
12 ÷ 4 of 3 × 6 + 8 ÷ 16 of 4 × 8 – 4 ÷ 6 × 9

SSC CHSL 10/07/2024 (Shift-01)

(a) – 1 (b) 1
(c) $6\frac{1}{4}$ (d) 13

45. Find the value of
12 + 24 ÷ 2 – 7 × 30 ÷ 6 + (5 + 4) × 8 + 8 ÷ 8 – 8.

SSC CPO 27/06/2024 (Shift-01)

(a) 45 (b) 85
(c) 54 (d) 58

46. Simplify the following expression
25 × 25 + 9 × 9 + 6 × 6 + 2 × 25 × 9 + 2 × 9 × 6 + 2 × 25 × 6

SSC CPO 27/06/2024 (Shift-02)

(a) 900 (b) 1200
(c) 1600 (d) 2500

47. Simplify:
8.2 + 2.6 + 3.2 – 4.5 ÷ 0.9 × 1.2

SSC CPO 27/06/2024 (Shift-02)

(a) 8 (b) 6
(c) 4 (d) 10

48. Simplify:
5 × [14 ÷ 13 × {13 × 14 ÷ (14 × 14)}]

SSC CPO 27/06/2024 (Shift-02)

(a) 10 (b) 5
(c) 20 (d) 15

49. Simplify:
[{38 – (–6)} × {9 – (8 – 1)}] ÷ [4 × {6 ÷
(–4)}].

SSC CPO 27/06/2024 (Shift-0

(a) 11 (b) 18
(c) 22 (d) 14

50. Find the value of [{(82 + 48 ÷ 8 × 3) + 5 × 6} – 7.5 × 2].

SSC CPO 28/06/2024 (Shift-0

(a) 115 (b) 130
(c) 121 (d) 125

51. If x [– 5 {– 4 (–a)}] + 6 [– 3 {– 3 (– a)}] = 6a, then the value of x is:

SSC CPO 28/06/2024 (Shift-0

(a) – 1 (b) 0
(c) – 3 (d) 2

52. Simplify
20 ÷ 5 of 4 × 8 + 6 ÷ 24 of 3 × 48 – 6 ÷ 18 × 9.

SSC CPO 28/06/2024 (Shift-0

(a) 9 (b) 6
(c) 4 (d) 1.125

53. The value of 64 ÷ [44 – (8 of 3 – 16) ÷ 4 × 20] is equal to:

SSC CPO 28/06/2024 (Shift-0

(a) 12 (b) 18
(c) 16 (d) 15

54. The value of 66 ÷ [34 – (32 of 2 –
÷ (4 × 15)] is equal to:

SSC CPO 28/06/2024 (Shift-0

(a) 2 (b) 1
(c) 0 (d) 3

55. If 855 ÷ 15 – k + 32 × 5 = 1152 ÷ 1
× 111 ÷ 37, then the value of k is:

SSC CPO 28/06/2024 (Shift-0

(a) 2 (b) 1
(c) 0 (d) 3

56. Find the value of
15% of 1.5 + 0.15 ÷ 0.1 + 0.01 o
1.1 × 0.5 + 2.5 × 25.

SSC CPO 28/06/2024 (Shift-0

(a) 77.2305 (b) 64.2305
(c) 62.2305 (d) 6.42305

57. Simplify the following expression.
(6 + 6 of 5 ÷ 5) ÷ 6 of 5 + (24 ÷ 2
3 – 6 of 5 + 4)

SSC CPO 28/06/2024 (Shift-0

(a) $-26\frac{2}{5}$ (b) $-17\frac{2}{5}$
(c) $-21\frac{3}{5}$ (d) $-23\frac{1}{5}$

58. If 56 ÷ 4 + p × 3 – 24 ÷ 12 + 4 = 21
÷ 3 + 3 then the value of p is:

SSC CPO 28/06/2024 (Shift-0

(a) 2 (b) –1
(c) 1 (d) –2

59. Simplify
22.0625 – [15 + 0.25 × (4.78 – 1
× 3.02)]

SSC CPO 28/06/2024 (Shift-0

(a) 7.3 (b) 7.0
(c) 7.1 (d) 7.2

60. Simplify the following expression.
(4.2 of 2.5 + 3.5) − (3.6 + 2.4 + 2.5 of 3 + 7.5) + (6 − 3 of 2 + 4 of 3 ÷ 6)

SSC CPO 28/06/2024 (Shift-03)

(a) 2.5 (b) 4.5
(c) 3.5 (d) 1.5

61. Simplify the given expression.
4 × 5 + 4 of 5 × 4 ÷ (6 + 6 × 6 ÷ 6 of 6 − 6 + 6 × 6)

SSC CPO 29/06/2024 (Shift-01)

(a) 2 (b) 12
(c) 20 (d) 4

62. Simplify the given expression.

$$\left(7.2\times4.1+12.3+22.5\text{of}\frac{1}{25}-\frac{1}{10}\right)$$

SSC CPO 29/06/2024 (Shift-01)

(a) 4.9 (b) 3.2
(c) 7.4 (d) 9.6

63. The value of (12 + 18) ÷ 2 − 11 + 16 × 4 − 28 + 13(−18 + 15) is:

SSC CPO 29/06/2024 (Shift-02)

(a) 1 (b) 3
(c) 0 (d) 2

64. Simplify the given expression.
12.3 − [7 + 0.8 of (5.6 − 3.8 × 1.03)]

SSC CPO 29/06/2024 (Shift-02)

(a) 5.2314 (b) 7.8539
(c) 1.2368 (d) 3.9512

65. Simplify

$$8.16\times5.35+17.9-19.5\text{of}\frac{1}{15}+\frac{1}{5}$$

SSC CPO 29/06/2024 (Shift-03)

(a) 57.426 (b) 60.456
(c) 65.234 (d) 70.225

66. Simplify the following expression.

$$3\frac{1}{7}+1\frac{4}{7}+3\text{of}2\frac{2}{3}+2.5\times2.4+3\frac{1}{3}-4\text{of}3$$

SSC CPO 29/06/2024 (Shift-03)

(a) $-\frac{2}{5}$ (b) $-\frac{4}{5}$
(c) $-\frac{1}{5}$ (d) $-\frac{3}{5}$

67. Simplify the following expression:
$(x + y)(x - y)(x^2 + y^2)(x^4 + y^4)(x^8 + y^8)(x^{16} + y^{16})$

SSC Phase-XII 26/06/2024 (Shift-03)

(a) $x^{128} - y^{128}$ (b) $x^{64} - y^{64}$
(c) $x^{256} - y^{28}$ (d) $x^{32} - y^{32}$

68. The value of
11 × 11 + 11 + 11 − 11 × 11 + 11 + 11 × 11 − 11 − 11 × 11 is:

SSC CPO 03/10/2023 (Shift-01)

(a) 121 (b) 0
(c) 11 (d) 1

69. Simplify the given expression
b + 2a − [(3b + a) − (2a + b) + 2a] − a

SSC CPO 05/10/2023 (Shift-03)

(a) − a (b) − b
(c) a (d) b

70. Simplify the given expression
$(x - 2y)(y - 3x) + (x + y)(x - y) + (x - 3y)(2x + y)$

SSC CPO 05/10/2023 (Shift-03)

(a) $2x(x - 3y)$ (b) $2y(x + 3y)$
(c) $2x(x + 3y)$ (d) $2y(x - 3y)$

71. Which of the following expressions has value equal to 0?

MTS 04/09/2023 (Shift-02)

(a) [2 × 3 + 5 − {1 − 2(3 − 2 × 2)}]
(b) [2 × 3 − 5 − {1 + 2(3 − 2 × 2)}]
(c) [2 × 3 − 5 + {1 + 2(3 − 2 × 2)}]
(d) [2 × 3 − 5 − {1 − 2(3 − 2 × 2)}]

72. If $(2^3 + 4)^2 \times (3 - 5) + 20\%$ of 400 + $x\%$ of 30 = 30% of 30, find the value of x.

SSC CHSL 04/08/2023 (Shift-02)

(a) 150 (b) 120
(c) 190 (d) 160

73. If four-fifths of five sixths of one-eight of a certain number is 4365, what is 65% of the number?

SSC CHSL 11/08/2023 (Shift-01)

(a) 36,375 (b) 53,280
(c) 34,047 (d) 52,380

74. −7p − [3q − {8p−(4q−10p)}] = ?

SSC CGL 25/07/2023 (Shift-04)

(a) 7p − 11q (b) 11p − 7q
(c) 9p − 12q (d) 12p − 9q

75. Find the value of 0.5 + 0.55 + 0.555 + 0.5555:

SSC MTS 09/05/2023 (Shift-03)

(a) 1.4405 (b) 1.0555
(c) 1.5555 (d) 2.1605

76. What is the value of x?
If x = 0.05 × 0.36 ÷ 0.4 + 0.055 + 1.50 ÷ 0.03

SSC CHSL 13/03/2023 (Shift-03)

(a) 45.9 (b) 50.1
(c) 55.1 (d) 49.9

77. Simplify the below given equation. What is the difference between the two value of x?

$$7x + 4[x^2 + (5x + 10)] - 3\left\{5\frac{1}{3} - x^3 + \left(3x^2 + x\right)\right\} = 0$$

SSC CGL 07/12/2022 (Shift-01)

(a) 8 (b) 16
(c) 5 (d) 17

78. Simplify the following

$$81^{\frac{3}{4}} + [(20 \div 5 \text{ of } 3 \times 6) + \{(8 \div 24 \text{ of } 3) \times 4\} - 10 + 5] - \left(\frac{1}{32}\right)^{\frac{2}{5}}$$

SSC CPO 09/11/2022 (Shift-01)

(a) $24\frac{1}{4}$ (b) $21\frac{1}{9}$
(c) $27\frac{4}{5}$ (d) $29\frac{4}{9}$

79. The value of $4^3 - 0^2 + \left(\frac{22}{2}\right)^2 - 8 + 7 \times 6$ = ______

SSC CGL TIER-II (18/01/2025)

(a) 224 (b) 229
(c) 219 (d) 218

80. Simplify the following expression.
$(36p^2 + 49q^2)(6p + 7q)(6p - 7q)$

SSC CHSL 24/05/2022 (Shift-01)

(a) $1296p^4 + 2401q^4$
(b) $36p^4 - 49q^4$
(c) $1296p^4 - 2401q^4$
(d) $36p^4 + 49q^4$

81. Simplify: $(5 \times 5 \times 5 \times 5 \times 5)^5 \times (5 \times 5 \times 5)^5 \div 5 = (125)^?$.

SSC CHSL 10/06/2022 (Shift-01)

(a) 15 (b) 21
(c) 13 (d) 14

82. What is the value of p, if 25 (3+4p) − 12 of 5 − 3 × 8 = 6 ?

SSC CGL 13/04/2022 (Shift-03)

(a) $15\frac{1}{3}$ (b) 69
(c) 72 (d) $17\frac{1}{4}$

83. (5 + 3 ÷ 5 × 5) ÷ (3 ÷ 3 of 6) of (4 × 4 ÷ 4 of 4 + 4 ÷ 4 × 4) =?

SSC CGL 06/06/2019 (Shift-01)

(a) $8\frac{1}{5}$ (b) $7\frac{1}{3}$
(c) $9\frac{3}{5}$ (d) $6\frac{2}{3}$

84. Simplify the following expression.

$$3\frac{1}{5}\text{ of }2\frac{3}{4}\div\frac{11}{3}+\left(2\frac{1}{5}\div1\frac{2}{5}\text{ of }1\frac{3}{7}-2\frac{1}{3}\right)$$

SSC CPO 27/06/2024 (Shift-01)

(a) $4\frac{1}{6}$ (b) $2\frac{1}{6}$
(c) $3\frac{1}{6}$ (d) $1\frac{1}{6}$

85. The value of

$$5\frac{1}{4}-\left[3\frac{1}{2}-\left\{\frac{5}{6}-\left(\frac{3}{5}\times\frac{1}{10}\div\frac{4}{15}\right)\right\}\right]\text{ is:}$$

SSC CPO 28/06/2024 (Shift-01)

(a) $1\frac{81}{120}$ (b) $1\frac{97}{120}$
(c) $2\frac{43}{120}$ (d) $2\frac{47}{120}$

86. Simplify the given expression.

$$\frac{\left(2\frac{1}{7}+6\frac{1}{7}\right)\div\frac{9}{7}}{1\frac{1}{9}\div\left\{\frac{7}{9}+\left(\frac{4}{9}\div\frac{4}{3}\right)\right\}}$$

SSC CPO 29/06/2024 (Shift-01)

(a) $\frac{53}{9}$ (b) $\frac{56}{9}$
(c) $\frac{58}{9}$ (d) $\frac{55}{9}$

87. The value of

$$\frac{3+8\times 8\div 8\text{of}8+7\div 7\times 2}{5\div 5\text{of}4+3\times 3\div 3-3+2}$$ is:

SSC CHSL 08/08/2023 (Shift-04)

(a) $1\frac{3}{5}$ (b) $2\frac{2}{3}$

(c) $1\frac{4}{7}$ (d) $2\frac{3}{7}$

88. Simplify the following expression.

$$\left[\frac{85}{34}\times\frac{1}{18}-\left\{\left(\frac{46}{69}\div\frac{27}{135}\right)-\left(\frac{86}{129}\times\frac{91}{14}\right)\right\}\text{of}\frac{112}{36}\right]=?$$

SSC CGL 14/07/2023 (Shift-03)

(a) $3\frac{1}{5}$ (b) $3\frac{3}{4}$

(c) $3\frac{1}{2}$ (d) $3\frac{1}{4}$

89. Simplify

$$5\frac{1}{3}-\left\{4\frac{1}{3}+\left(3\frac{1}{3}\div\overline{2\frac{1}{3}-\frac{1}{3}}\right)\right\}$$

SSC CPO 04/10/2023 (Shift-01)

(a) $-\frac{2}{3}$ (b) $-\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{1}{3}$

90. Which of the following can be the value of k, if $\frac{(88\div 8\times k-3\times 3)}{(6^2-7\times 5+k^2)}=1$?

SSC CGL 09/09/2024 (Shift-01)

(a) 1,10 (b) 4,7

(c) 3,10 (d) 2,7

91. Simplify

$$1020\div\left[\frac{4}{3}\text{ of }(26+4)-11\frac{2}{3}\right]$$

SSC CGL 11/09/2024 (Shift-02)

(a) 28 (b) 36

(c) 17 (d) 31

92. Simplify

$$4\frac{4}{5}\times\frac{3}{8}+\left(3\frac{1}{2}+\frac{2}{3}\right)\times\frac{4}{5}$$

SSC CGL 11/09/2024 (Shift-03)

(a) $\frac{15}{77}$ (b) $\frac{77}{15}$

(c) $\frac{3}{10}$ (d) $\frac{10}{3}$

93. Solve the following.

$$\left[(2.5+1.5)^2\div 4\text{of}\frac{1}{2}\times 8-1\right]$$

SSC CGL 12/09/2024 (Shift-02)

(a) 0 (b) 81

(c) 27.1 (d) 63

94. Simplify

$$1\frac{1}{3}+1\frac{3}{4}\times 1\frac{2}{3}\div 3\frac{1}{2}$$

SSC CGL 13/09/2024 (Shift-02)

(a) $2\frac{1}{3}$ (b) $2\frac{1}{6}$

(c) $2\frac{1}{5}$ (d) $3\frac{1}{4}$

95. Simplify

$$\left[\left(\frac{1}{6}\div\frac{1}{9}\times\frac{2}{3}\right)\times 18+5\right]$$

SSC CGL 17/09/2024 (Shift-01)

(a) 9 (b) 23

(c) 27 (d) 15

96. Simplify the following.

$$\left(5-\frac{15}{16}\right)\times 1\frac{12}{13}.$$

SSC CGL 17/09/2024 (Shift-02)

(a) $7\frac{13}{16}$ (b) $7\frac{11}{16}$

(c) $5\frac{13}{16}$ (d) $5\frac{11}{16}$

97. Simplify $-\frac{7}{6}+\frac{4}{9}+\frac{5}{3}\times\frac{1}{16}$

SSC CGL 17/09/2024 (Shift-03)

(a) $-\frac{23}{20}$ (b) $-\frac{23}{18}$

(c) $-\frac{20}{23}$ (d) $-\frac{18}{23}$

98. Simplify the following.

$$\left[\left(5\frac{1}{2}-3\frac{1}{3}\right)\text{of}1\frac{5}{13}+1-2\times 3\frac{5}{2}\div 2\frac{3}{4}\right]$$

SSC CGL 18/09/2024 (Shift-01)

(a) 0 (b) $\frac{11}{2}$

(c) –2 (d) $3\frac{1}{2}$

99. The value of $4\frac{1}{6}\div 25\times 75\div\frac{1}{5}$ of 125 is:

SSC CGL 19/09/2024 (Shift-01)

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$

(c) $\frac{1}{6}$ (d) $\frac{1}{2}$

100. $9\div\left[1+\left\{4\times\left(\frac{5}{6}-\overline{\frac{1}{3}+\frac{1}{2}}\right)\right\}\right]$ is equal to:

SSC CGL 25/09/2024 (Shift-01)

(a) 1 (b) $\frac{9}{5}$

(c) 0 (d) 9

101. What is the value of the following expression

$$\frac{4}{7}\times 4\frac{1}{2}\div 5\frac{1}{3}\text{ of }2\frac{1}{2}-\left(7\frac{7}{8}\div 5\frac{1}{9}\text{of }9\frac{9}{20}\right)+\frac{1}{2}$$

SSC CHSL 01/07/2024 (Shift-02)

(a) $\frac{853}{1610}$ (b) $\frac{1093}{111}$

(c) $\frac{1113}{856}$ (d) $\frac{1759}{3250}$

102. The value of

$$\left(\frac{7+8\times 7\div 8+7\div 7\div 7}{3+3\times 3+3\div 5+5\div 5}\right)$$

SSC CHSL 01/07/2024 (Shift-0

(a) $3\frac{27}{217}$ (b) $1\frac{81}{217}$

(c) $2\frac{61}{217}$ (d) $1\frac{31}{217}$

103. If $A=60\left[\frac{6}{25}\div\left(\frac{16}{15}\text{of}\frac{3}{8}\right)+5-\left(1-2\frac{1}{12}\right)\right]$, then the sum of the digits of A is:

SSC CHSL 10/07/2024 (Shift-0

(a) 7 (b) 3

(c) 5 (d) 6

104. If $\frac{15}{8}+\left[\left\{\frac{4}{5}\text{of}\frac{5}{12}\div\left(1\frac{1}{15}\right)\right\}\times 1\frac{7}{12}\right]$ i expressed in the form of $\frac{a}{b}$ where a and b are integers and relatively prime to each other, the value 4b – a is:

SSC CHSL 11/07/2024 (Shift-05

(a) 313 (b) 225

(c) 164 (d) 189

105. what is the value of the following expression ?

$$\left(24\div 3\text{of}\frac{1}{6}\right)\times\left(\frac{4}{5}\div\frac{9}{8}\times\frac{3}{5}\right)\div\left(\frac{4}{7}\div\frac{3}{14}\text{of}\frac{3}{14}\right)$$

SSC CHSL 09/07/2024 (Shift-03

(a) $\frac{579}{459}$ (b) $\frac{288}{175}$

(c) $\frac{379}{179}$ (d) $\frac{363}{553}$

106. Simplify

SSC CHSL 05/07/2024 (Shift-02

$$\frac{\frac{1}{2}\div\frac{3}{4}\text{of}\frac{5}{6}}{\frac{1}{2}\div\frac{3}{4}\times\frac{5}{6}}+\frac{2+2\times 2}{2\div 2\times 2}$$

(a) $\frac{121}{25}$ (b) 4

(c) $\frac{111}{25}$ (d) $\frac{75}{36}$

107. If $A=\frac{9}{16}\div\frac{25}{36}$, B = 9 ÷ [(16 ÷ 2 ÷36], C = [9 ÷ (16 ÷ 25)] ÷ 36, D = (÷ 16) ÷ (25 ÷ 36), then which of th following is true?

SSC CHSL 10/07/2024 (Shift-

(a) B and D are equal.

(b) C and D are equal.

(c) A and B are equal.

(d) A and D are equal.

108. The value of $1\frac{1}{3}\div\left[2\frac{1}{6}\div\left\{1+\frac{1}{3}-\left(2\frac{1}{3}\div3\frac{1}{2}\right)\right\}\right]$ is:

SSC CHSL 11/07/2024 (Shift-03)

(a) $3\frac{2}{13}$ (b) $5\frac{3}{13}$
(c) $4\frac{3}{17}$ (d) $3\frac{3}{17}$

109. The value of

$$\frac{5+7\times5\div8\text{ of }5+3\div3\times5}{6\div6\text{ of }4+9\times9\div3\times2\times2}\text{ is:}$$

SSC CHSL 09/07/2024 (Shift-03)

(a) $\frac{77}{861}$ (b) $\frac{97}{881}$
(c) $\frac{67}{859}$ (d) $\frac{87}{866}$

110. Simplify the following expression.

$$2\frac{1}{4}\times3\frac{1}{5}\div5\frac{1}{6}\text{ of }2\frac{4}{31}\div3\frac{2}{3}\div4\frac{1}{7}\text{ of }1\frac{6}{29}.$$

SSC CHSL 03/07/2024 (Shift-04)

(a) $13\frac{1}{5}$ (b) $16\frac{1}{5}$
(c) $14\frac{1}{5}$ (d) $15\frac{1}{5}$

111. What is the value of the following expression?

$$420\div\left[\frac{4}{9}\times\left(1+\frac{4}{5}\right)\times5\right]\div\left[\frac{5}{7}\text{ of }\frac{21}{25}\div\frac{3}{4}\text{ of }\frac{2}{5}\right]$$

SSC CHSL 08/07/2024 (Shift-03)

(a) 139 (b) 127
(c) 107 (d) 89

112. Simply the following expression.

$$469\div\left[270\div\left(\frac{3}{7}\times35\right)+(19\times3)-\left(\frac{21}{2}-\frac{5}{2}\right)\right]$$

SSC CHSL 09/07/2024 (Shift-02)

(a) 7 (b) 13
(c) 9 (d) 11

113. Solve $\frac{2\times2+2}{2\div2\times2}\div\frac{\frac{1}{2}\div\frac{1}{2}\text{ of }\frac{1}{2}}{\frac{1}{2}+\frac{1}{2}\text{ of }\frac{1}{2}}$

SSC CHSL 08/07/2024 (Shift-01)

(a) $4\frac{1}{8}$ (b) $1\frac{1}{8}$
(c) $2\frac{1}{8}$ (d) $3\frac{1}{8}$

114. Evaluate the given expression.

$$\left[7+9-2\left\{\left(3+\frac{1}{3}\right)-3\right\}+27\div3+(27+9\div3)-6\right]\div2$$

SSC CHSL 05/07/2024 (Shift-03)

(a) 22 (b) 20
(c) 19 (d) 15

115. Simplify:

$$3\frac{4}{7}\div\left[16\frac{1}{2}+\left\{6^2-\left(7-2\frac{1}{2}\right)\right\}\right]$$

SSC CHSL 04/07/2024 (Shift-03)

(a) $\frac{64}{21}$ (b) $\frac{25}{21}$
(c) $\frac{64}{11}$ (d) $\frac{25}{11}$

116. The value of $10\div3\frac{3}{5}\div\left[2\frac{2}{3}\div\left\{7\frac{1}{6}\cdot\left(2\frac{1}{2}\div\frac{2}{3}\right)\right\}\right]$ is equal to:

SSC CHSL 04/07/2024 (Shift-02)

(a) $\frac{77}{5}$ (b) $\frac{5}{77}$
(c) $\frac{55}{27}$ (d) $\frac{27}{55}$

117. Simplify:

$$\left\{(3^3+2^3)\times\frac{22}{7}\right\}\times\left\{(6^2+3^2-4^2)\div\left(14\frac{1}{2}\right)\right\}$$

SSC CHSL 02/07/2024 (Shift-03)

(a) 145 (b) 220
(c) 198 (d) 110

118. Simplify the given expression.

$$\left[3\times6-3\left\{2\left(2\div\frac{1}{2}-2\right)\div2\div\frac{1}{2}\right\}-18\right]$$

SSC CHSL 04/07/2024 (Shift-04)

(a) −18 (b) −24
(c) 24 (d) 18

119. Simplify

$$\left[6-2\left\{3-4\left(4\div\frac{1}{4}-1\right)\div2\div\frac{1}{3}\right\}-3\times2\right]$$

SSC CHSL 09/07/2024 (Shift-04)

(a) 92 (b) 102
(c) 98 (d) 96

120. Simplify

$$4\frac{1}{4}\times4\frac{1}{4}-2\times4\frac{1}{4}\times\frac{1}{4}+\frac{1}{4}\times\frac{1}{4}$$

SSC CHSL 08/07/2024 (Shift-03)

(a) 4 (b) 16
(c) 32 (d) 64

121. What is the value of

$$\frac{\left[\frac{1}{4}\div\frac{1}{4}\times\frac{1}{4}\right]\times\frac{1}{4}}{\left[\frac{1}{8}\div\frac{1}{8}\times\frac{1}{8}\right]}\div\left(1-\frac{4}{9}\right)?$$

SSC CHSL 11/07/2024 (Shift-01)

(a) 3 (b) 1
(c) 2 (d) 0

122. Simplify the following:

$$\frac{3}{2}\times\frac{11}{5}\div\left(\frac{25}{44}\times\frac{11}{5}\right)\div\frac{33}{15}=?$$

SSC CHSL 02/07/2024 (Shift-04)

(a) $\frac{2}{3}$ (b) $\frac{6}{5}$
(c) $\frac{1}{2}$ (d) $\frac{5}{6}$

123. Simplify the following expression.

$$11\frac{1}{4}\div3\frac{3}{5}\times6\frac{2}{3}\div\frac{1}{6}=\_\_\_\_\_\_$$

SSC CHSL 09/07/2024 (Shift-04)

(a) 23 (b) 25
(c) 19 (d) 21

124. Find the value of

$$[18-3\times\{3-3\times\left(3\div\frac{1}{3}-3\right)\div3\div\frac{1}{3}\div3\}-4\times2]$$

SSC CPO 27/06/2024 (Shift-01)

(a) 18 (b) 19
(c) 12 (d) 15

125. The possible value of x satisfying $\frac{(143\div13\times x-3\times3)}{(6^2-7\times5+x^2)}=1$ is:

SSC CPO 27/06/2024 (Shift-01)

(a) 1 (b) 3
(c) 2 (d) 4

126. Find the value of

$$\frac{12\div3\frac{2}{3}\div\left[1\frac{3}{4}\div\left\{5\frac{1}{4}\times\left(3\frac{3}{5}\div4\frac{1}{2}\right)\right\}\right]}{1\frac{1}{3}\times5\frac{1}{5}}$$

SSC CPO 27/06/2024 (Shift-02)

(a) 5 (b) 3
(c) 1 (d) 2

127. Simplify:

$$\left[3\frac{2}{5}\times\left\{2\frac{3}{4}+3.3\left(5\frac{1}{3}+3\frac{1}{3}-2\frac{1}{3}\right)\right\}\right]$$

SSC CPO 28/06/2024 (Shift-02)

(a) 80.41 (b) 46.29
(c) 53.25 (d) 70.25

128. Find the value of:

$$\left[9\div3-2\times\left\{\left(4\div\frac{1}{4}\right)-4\right\}+81\div9\div81\div9\div3-9\right]\div9$$

SSC CPO 28/06/2024 (Shift-03)

(a) 0 (b) 6
(c) 9 (d) 3

129. Simplify the following

$$\frac{2\left\{3\div3\left(\frac{1}{4}\div\frac{15}{20}\div2\right)-18\times\frac{1}{3}\right\}}{2(4\div20\div4)}$$

SSC CPO 28/06/2024 (Shift-03)

(a) $\frac{7}{18}$ (b) $\frac{4}{9}$
(c) $\frac{5}{9}$ (d) $\frac{11}{18}$

130. Simplify the given expression.

$$\frac{13\div\{6-6\div(7-9)\times8\div9\}}{5\div5\times5\div5\text{ of }5}$$

SSC CPO 28/06/2024 (Shift-03)

(a) 13 (b) 39
(c) $\frac{1}{18}$ (d) $\frac{1}{2}$

131. The value of $\left(2\frac{1}{2}+1\frac{3}{4}-\frac{1}{6}\right)\times16\div49$ is:

SSC CPO 29/06/2024 (Shift-01)

(a) $\frac{4}{7}$ (b) $1\frac{1}{3}$
(c) $2\frac{3}{4}$ (d) $\frac{3}{9}$

132. Simplify:

$$\left[\left(7\frac{1}{4}\right)^2-\left(5\frac{4}{5}\right)^2\right]\div 5\frac{4}{5}\times\frac{16}{9}$$

SSC CPO 29/06/2024 (Shift-01)

(a) 9.3
(b) 3.1
(c) 5.8
(d) 7.4

133. The value of

$$\frac{7+8\times 8\div 8 \text{ of } 8+8\div 8\times 5}{4\div 4 \text{ of } 4+4\times 4\div 4-4\div 4} \text{ is:}$$

SSC CPO 29/06/2024 (Shift-02)

(a) 4
(b) 1
(c) 3
(d) 2

134. The value of

$$\frac{1}{2^2}\div\frac{1}{2^3}\div\left(\frac{1}{2}\div\frac{1}{2}+1\right)\div 3\frac{1}{3}\div\frac{5}{2}\times\frac{3}{4}\div 6\frac{2}{3}\times\frac{7}{6}$$

is:

SSC CPO 29/06/2024 (Shift-02)

(a) $\frac{11}{20}$
(b) $\frac{11}{30}$
(c) $\frac{21}{20}$
(d) $\frac{7}{40}$

135. Simplify the given expression

$$55\frac{1}{3}\div\left[3\frac{1}{5}+\left\{2\frac{1}{2}-\left(2\frac{1}{3}+\frac{3}{5}\right)\right\}\right]$$

SSC CPO 29/06/2024 (Shift-03)

(a) 25
(b) 35
(c) 20
(d) 15

136. The value of

$$\frac{61+\frac{2}{5}\times 75\div 6-\left(3\times 6\div\frac{1}{3}\right)\times\frac{1}{6}}{5+\frac{2}{3}\times(58-37)} \text{ is:}$$

SSC CPO 29/06/2024 (Shift-03)

(a) 19
(b) 11
(c) 3
(d) 57

137. The simplified form of the expression

$$\frac{(x^2-9)\times(9x^2-1)}{\left(x-\frac{1}{3}\right)\times\left(1-\frac{x}{3}\right)}\times\frac{9}{\left(x+\frac{1}{3}\right)\left(1+\frac{x}{3}\right)}.$$

SSC CHSL TIER-II 10/01/2024

(a) –729
(b) 81
(c) 729
(d) –81

138. What is the value of

$$\left[\frac{1}{8}\div\left\{\frac{1}{6}\times\left(\frac{36}{45}\div\frac{24}{25}\right)-\left(\frac{12}{21}\times\frac{14}{15}\div\frac{24}{45}\right)\right\}\div\frac{27}{36}\right]$$

SSC CGL Tier-II 26/10/2023

(a) $\frac{1}{27}$
(b) $\frac{1}{108}$
(c) $\frac{1}{72}$
(d) $\frac{1}{36}$

139. Simplify the given expression

$$\frac{a^2-b^2-2bc-c^2}{a^2+b^2+2ab-c^2}$$

SSC CPO 03/10/2023 (Shift-02)

(a) $\frac{a-b+c}{a+b+c}$
(b) $\frac{a+b+c}{a-b-c}$
(c) $\frac{a+b-c}{a-b-c}$
(d) $\frac{a-b-c}{a+b-c}$

140. The value of

$$1\frac{2}{5}-\left[3\frac{3}{4}\div\left\{1\frac{1}{4}+\frac{1}{2}\left(1\frac{1}{2}\times 3\frac{1}{3}\div 1\frac{1}{3}\right)\right\}\right] \text{ is}$$

SSC CPO 04/10/2023 (Shift-01)

(a) 1
(b) 3
(c) 2
(d) 0

141. Evaluate

$$3\frac{1}{2}-\left[2\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{3}{4}\left(1\frac{1}{2}-\frac{1}{2}-2\frac{1}{2}\right)\right\}\right]:$$

SSC MTS 11/09/2023 (Shift-01)

(a) $2\frac{21}{38}$
(b) $1\frac{21}{38}$
(c) $\frac{47}{38}$
(d) $\frac{19}{18}$

142. What is the value of

$$\frac{\left[\frac{1}{5}\div\frac{1}{5}\times\frac{1}{5}\right]\times\frac{1}{5}}{\left[\frac{1}{9}\div\frac{1}{9}\times\frac{1}{9}\right]\times\frac{1}{10}}\div\left(1-\frac{6}{25}\right)=?$$

SSC MTS 12/09/2023 (Shift-02)

(a) 4
(b) 1
(c) 2
(d) 3

143. What is the value of the given expression ?

$$\frac{4^{x+4}-5\times 4^{x+2}}{15\times 4^x-2^2\times 4^x}$$

SSC CGL 24/07/2023 (Shift-01)

(a) 16
(b) 64
(c) 20
(d) 24

144. Simplify

$$\frac{1}{2+2p}+\frac{1}{2+2q}+\frac{1}{2+2r}$$

when $p=\frac{x}{y+z}$, $q=\frac{y}{z+x}$ and $r=\frac{z}{x+y}$.

SSC CGL 24/07/2023 (Shift-04)

(a) 1
(b) $x+y+c$
(c) 2
(d) $\frac{1}{2}$

145. Simplify the following expression.

$$\frac{x^2-2x-63}{x^2+14x+49}$$

SSC CGL 25/07/2023 (Shift-03)

(a) $\frac{x+9}{x+7}$
(b) $\frac{x-7}{x+7}$
(c) $\frac{x+7}{x-7}$
(d) $\frac{x-9}{x+7}$

146. Find the value of

$$\frac{\frac{49}{63}+\frac{21}{9}-\frac{85}{510}+\frac{88}{132}+\frac{66}{11}}{\frac{1}{7}+\frac{33}{21}+\frac{26}{143}-\frac{1}{209}+\frac{1}{19}}$$

SSC MTS 19/06/2023 (Shift-02)

(a) $\frac{55}{36}$
(b) $\frac{55}{39}$
(c) $\frac{13}{46}$
(d) $\frac{44}{13}$

147. What is the value of

$$\frac{\frac{5}{2}\div\frac{2}{5}\times\frac{1}{5}-\frac{1}{5}\div\frac{3}{5}\times\frac{5}{2}}{\frac{2}{5}\div\frac{1}{5}-\frac{1}{2}\times\frac{5}{2}\div\frac{25}{4}+\frac{1}{2}\div\frac{2}{5}\times\frac{1}{5}}\ ?$$

SSC CHSL 09/03/2023 (Shift-01)

(a) $\frac{31}{127}$
(b) $\frac{32}{127}$
(c) $\frac{28}{125}$
(d) $\frac{25}{123}$

148. The value of 25% of 720 + 57 ÷ 19 × $\frac{1}{3}$ of $\frac{100}{11}$ of $\frac{33}{25}$ –15% of 300 is:

SSC CHSL 13/03/2023 (Shift-02)

(a) 191
(b) 157
(c) 127
(d) 147

149. What is the value of $\frac{7\times 4\div 8}{5\times 25\div 125}+\frac{5\times 4\div 8}{8\times 4\div 16}-\frac{7\times 4\div 2}{8\times 7\div 4}$?

SSC CHSL 14/03/2023 (Shift-04)

(a) 4
(b) $\frac{13}{4}$
(c) $\frac{15}{4}$
(d) $\frac{9}{2}$

150. What is the value of

$$\frac{\frac{5}{6}\text{ of }\frac{1}{3}\times\frac{12}{25}-\frac{1}{3}\text{ of }\frac{5}{6}\times\frac{18}{25}}{\frac{25}{12}\text{ of }\frac{1}{6}\times\frac{2}{5}+\frac{3}{8}\text{ of }\frac{12}{25}\times\frac{5}{6}}\ ?$$

SSC CHSL 17/03/2023 (Shift-01)

(a) $-\frac{3}{13}$
(b) $-\frac{5}{13}$
(c) $-\frac{8}{25}$
(d) $-\frac{3}{25}$

151. What is the value of

$$\frac{\frac{3}{4}\div\frac{9}{64}+\frac{7}{11}\times\frac{121}{14}-\frac{9}{13}\times\frac{65}{36}}{\frac{1}{2}\div\frac{4}{5}+\frac{3}{4}\times\frac{16}{15}}\ ?$$

SSC CHSL 21/03/2023 (Shift-02)

(a) $\frac{1169}{143}$
(b) $\frac{1150}{171}$
(c) $\frac{1413}{157}$
(d) $\frac{1216}{141}$

152. Solve the following equation.

$$456-(76+15^2)+\frac{3}{4}\text{ of }\frac{76}{18}\div\left(\frac{19}{72\times 24}\right)=?$$

SSC CPO 10/11/2022 (Shift-02)

(a) 443
(b) 256
(c) 356
(d) 401

153. Find the value of following expression

$$\frac{\left[\frac{5}{8}-\left\{\frac{3}{8}-\left(\frac{5}{8}-\frac{3}{8}\right)\right\}\right]\text{ of }8.8-1.2}{4\frac{1}{6}\div 2.5\times 2+\frac{1}{6}\text{ of }60\div\left(\frac{3}{4}-\frac{3}{8}\right)}$$

SSC CPO 11/11/2022 (Shift-01)

(a) $5\frac{22}{43}$
(b) $3\frac{23}{67}$
(c) $4\frac{44}{85}$
(d) $4\frac{4}{5}$

154. Find the value of a in the following equation. (given a < 10)

$$\frac{(187 + 17 \times a - 3 \times 3)}{(8^2 - 9 \times 7 + a^2)} = 1$$

SSC CPO 11/11/2022 (Shift-02)

(a) 2 (b) 1
(c) 4 (d) 3

155. Solve the following.

$$\left[25^2 \div 8 \div 2^3 - \left\{\begin{matrix} 16 + (28 \text{ of } 7 \div 2^2) \\ -\left(18^2 \div 12^2 \text{ of } \frac{1}{8}\right)\end{matrix}\right\}\right]$$

SSC CPO 11/11/2022 (Shift-03)

(a) 626 (b) 529
(c) 721 (d) 579

156. If $\frac{2x+3}{18 \div 3 \times 4 \div 2} = \frac{12 \times 3 + 5}{2 \times 4 \div 2}$ then what is the value of x?

SSC MTS 11/07/2022 (Shift-03)

(a) 132.25 (b) 131.75
(c) 134.35 (d) 120.5

157. If A = $\frac{2}{3} \div \frac{4}{7}$ of $\frac{14}{12}$ & B = $\frac{5}{12}$ of $\frac{7}{15} \times \frac{36}{21}$ then what is the value of A + B?

SSC MTS 18/07/2022 (Shift-01)

(a) $\frac{5}{3}$ (b) 2
(c) $\frac{4}{3}$ (d) $\frac{2}{3}$

158. $$\frac{\frac{5}{6} - \frac{5}{11} \text{ of} \left[\frac{3}{7} + \frac{8}{12} \div \frac{6}{24} + \frac{5}{7}\right]}{\frac{3}{12} \times \frac{6}{5}} = ?$$

SSC MTS 22/07/2022 (Shift-02)

(a) $\frac{-1891}{691}$ (b) $\frac{2075}{693}$
(c) $\frac{-1894}{891}$ (d) $\frac{-2075}{693}$

159. The value of $\frac{46 + \frac{3}{4} \text{ of } 32 - 6}{37 - \frac{3}{4} \text{ of } (34 + 6)}$

SSC CGL 18/04/2022 (Shift-01)

(a) $\frac{64}{7}$ (b) $\frac{44}{7}$
(c) $\frac{54}{7}$ (d) $\frac{34}{7}$

160. The value of

$$\left[25 \div 8 \div 2 - \left\{\begin{matrix} 16 \div (14 \text{ of } 7 \div 14) \\ -\left(18 \div 12 \text{ of } \frac{1}{2}\right)\end{matrix}\right\}\right]$$

SSC CGL 20/04/2022 (Shift-01)

(a) 6 (b) 3
(c) 9 (d) 12

161. Find the value of the following expression:

$$\frac{1\frac{1}{2} + 1\frac{3}{7} \div \left(1\frac{3}{5} \text{ of } 1\frac{1}{4}\right) \times 2\frac{1}{3}}{2\frac{2}{3} \div \frac{4}{9} \times \frac{5}{6} + 14}$$

SSC CGL 20/04/2022 (Shift-03)

(a) $\frac{49}{114}$ (b) $\frac{13}{114}$
(c) $\frac{107}{342}$ (d) $\frac{1}{6}$

162. Simplify

$$\left[\left(5\frac{1}{4} \div 3\frac{1}{2} \times \frac{5}{12}\right) - \frac{3}{16}\right] \div \left(3\frac{4}{7} \div \frac{5}{14} \text{ of } 6\frac{2}{3}\right)$$

of $1\frac{1}{3}$.

SSC CGL 21/04/2022 (Shift-02)

(a) $\frac{17}{32}$ (b) $\frac{3}{32}$
(c) $\frac{5}{32}$ (d) $\frac{7}{32}$

163. The value of

$$\left(1\frac{1}{3} \div 2\frac{6}{7} \text{ of } 5\frac{3}{5}\right) \times \left(6\frac{2}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3}\right) \div \left(\frac{3}{4} \times 2\frac{2}{3} \div \frac{5}{9} \text{ of } 1\frac{1}{5}\right) = k,$$ where k lies between:

SSC CGL Tier-II 29/01/2022

(a) 0.007 and 0.008
(b) 0.0007 and 0.0008
(c) 0.7 and 0.8
(d) 0.07 and 0.08

164. Let $x = \frac{5\frac{3}{4} - \frac{3}{7} \times 15\frac{3}{4} \div 2\frac{2}{35} \div 1\frac{11}{25}}{\frac{3}{4} \div 5\frac{1}{4} \div 5\frac{3}{5} \div 3\frac{4}{15}}$, when y is added to x, then result is $\frac{7}{13}$. What is the value of y?

SSC CGL Tier-II 29/01/2022

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$
(c) $\frac{9}{13}$ (d) $\frac{4}{13}$

165. The value of

$$9 \div \left\{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{6} \div \left(\frac{3}{4} - \frac{1}{3}\right) \text{of} \frac{2}{9}\right\}$$ is:

SSC CGL Tier-II 03/02/2022

(a) $\frac{540}{173}$ (b) $\frac{480}{173}$
(c) $\frac{2540}{173}$ (d) $\frac{340}{173}$

166. What is the value of

$$\frac{3}{8} + \frac{1}{7} \times 1\frac{3}{4} + \left(\frac{2}{3} \div \frac{3}{10} \text{ of } \frac{4}{9}\right) - \left(3\frac{1}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3}\right) \times \frac{15}{8}.$$

SSC MTS 05/10/2021 (Shift-02)

(a) $5\frac{1}{2}$ (b) $10\frac{1}{2}$
(c) $10\frac{1}{4}$ (d) $5\frac{3}{8}$

167. Find the value of

$$4\frac{2}{5} \div \{(1\frac{1}{2} - 3\frac{1}{5}) \div 3\frac{2}{5} + (2\frac{1}{5} \div 1\frac{1}{2} + 4\frac{2}{5}) + \frac{1}{2}\}?$$

SSC MTS 22/10/2021 (Shift-03)

(a) $\frac{4}{7}$ (b) $\frac{3}{7}$
(c) $\frac{3}{5}$ (d) $\frac{3}{4}$

168. The value of

$$\frac{52 - 1170 \div 26 + 13 \times 2}{2 + 1\frac{1}{8} \text{ of } 2 - 1\frac{1}{4}}$$ is:

SSC CGL 16/08/2021 (Shift-01)

(a) 11 (b) 12
(c) 41 (d) 27

169. Simplify the expression

$$441 \div \left[270 \div \frac{3}{7} \div \left(17 \div \frac{1}{3}\right) - \left(8\frac{1}{2} - \frac{5}{2}\right)\right]$$

SSC CGL 18/08/2021 (Shift-03)

(a) $\frac{49}{75}$ (b) $\frac{39}{75}$
(c) $\frac{19}{75}$ (d) $\frac{29}{75}$

170. The value of [{(232 ÷ 29 of 2) + 77 × 10} ÷ 18] −

$$\frac{18 \times 8 \div 4 \text{ of } 3 - 4}{2 \times (8 - 6) + 1 - 2 \times 3 \div 4 \text{ of } 1/2}$$ is:

SSC CHSL 04/08/2021 (Shift-01)

(a) 39 (b) 47
(c) 44 (d) 33

171. The value of

$$18\frac{2}{11} \div \left[\frac{7}{33} + \left\{\frac{29}{6} - \frac{3}{11} \times \left(5\frac{1}{6} - 3\frac{1}{3}\right)\right\}\right]$$ is:

SSC CHSL 05/08/2021 (Shift-03)

(a) 4 (b) 2
(c) 8 (d) 5

172. $\frac{(a^7 \times b^8 \times c^7)}{(a^9 \times b^5 \times c^4)}$ in simplified form is:

SSC CGL TIER-II (18/01/2025)

(a) $(a^0) \times (b^2) \times (c^1)$
(b) $(a^{-7}) \times (b^2) \times (c^{-4})$
(c) $(a^{-2}) \times (b^3) \times (c^3)$
(d) $(a^{-5}) \times (b^{-8}) \times (c^0)$

173. $\frac{(a^3 \times b^3 \times c^7)}{(a^4 \times b^8 \times c^9)}$ in simplified form is:

SSC CGL TIER-II (20/01/2025)

(a) $(a^1) \times (b^{-5}) \times (c^{-2})$
(b) $(a^{-3}) \times (b^{-10}) \times (c^{-4})$
(c) $(a^{-1}) \times (b^{-4}) \times (c^{-5})$
(d) $(a^6) \times (b^6) \times (c^{-4})$

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174. The value of 95 × 105 is:

SSC CGL 03/12/2022 (Shift-03)

(a) 9981 (b) 9935
(c) 9965 (d) 9975

175. The value of 1801 ×1801 is:

SSC CPO 09/11/2022 (Shift-02)

(a) 3423601 (b) 3243601
(c) 2343601 (d) 3243106

176. Simplify 52 × 52 – 48 × 48

SSC Phase-XI 27/06/2023 (Shift-03)

(a) 400 (b) 386
(c) 424 (d) 326

177. Simplify the following expression:

$$\frac{(525+175)^2-(525-175)^2}{(525\times175)}$$

SSC CPO 27/06/2024 (Shift-03)

(a) 350 (b) 700
(c) 2 (d) 4

178. If $A=\frac{58^2-25^2}{46^2-37^2}$, $B=\frac{26^2-15^2}{56^2-15^2}$, then the value of $\frac{1}{B}-\frac{20}{A}$ is:

SSC CGL Tier-II 26/10/2023

(a) 2 (b) 1
(c) 0 (d) – 1

179. Simplify

$$\frac{(612+388)^2+(612-388)^2}{(612\times612)+(388\times388)}=?$$

SSC CHSL 04/08/2023 (Shift-04)

(a) 1 (b) 4
(c) 2 (d) 3

180. Simplify $(2z - 5y)^2 + (5z + 2y)^2 - 25z^2$.

SSC CHSL TIER-II (18/11/2024)

(a) $19y^2 - 4z^2$ (b) $29y^2 - 4z^2$
(c) $19y^2 + 4z^2$ (d) $29y^2 + 4z^2$

181. Simplify: $\frac{(25)^4+1250+1-(25)^2}{(25)^2+25+1}$

SSC CGL 19/09/2024 (Shift-03)

(a) 602 (b) 601
(c) 603 (d) 604

182. Simplify the following expression:

$$\frac{0.7^2+(0.4+0.2)(0.7)+(0.4\times0.2)}{(0.7+0.4)}$$

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 0.9 (b) 0.7
(c) 0.3 (d) 0.4

183. Simplify the following expression:

$$\frac{\left((32)^4-1\right)}{33\times31\times\left(2^{10}+1\right)}$$

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 2 (b) 1
(c) –2 (d) –1

184. The value of

$$\frac{(157\times157)+(157\times133)+(133\times133)}{(157\times157\times157)-(133\times133\times133)}$$

SSC CPO 04/10/2023 (Shift-02)

(a) 24 (b) $\frac{1}{290}$
(c) 290 (d) $\frac{1}{24}$

185. Simplify

$$\frac{256x^4-16y^4}{\left(80x^2-20y^2\right)\left(16x^2+4y^2\right)}$$

SSC CGL 25/07/2023 (Shift-02)

(a) 5 (b) $\frac{1}{20}$
(c) $\frac{1}{5}$ (d) $\frac{2}{5}$

186. Simplify the expression

$\frac{s^2+t^2+2st-u^2}{s^2-t^2-2tu-u^2}$, provided $(s + t + u) \neq 0$.

SSC CGL 25/07/2023 (Shift-04)

(a) $\frac{s+t-u}{s-t-u}$ (b) $\frac{s+t+u}{s-t+u}$
(c) $\frac{s-t-u}{s+t-u}$ (d) $\frac{s-t+u}{s+t+u}$

187. Simplify $(5z - 12y)^2 + (12z + 5y)^2 - 144z^2$

SSC CGL TIER-II (18/01/2025)

(a) $25z^2 + 169y^2$ (b) $23z^2 + 174y^2$
(c) $30z^2 + 170y^2$ (d) $23z^2 + 177y^2$

188. Simplify $(5z - 7y)^2 + (7z + 5y)^2 - 49z^2$

SSC CGL TIER-II (20/01/2025)

(a) $25z^2 + 74y^2$ (b) $35z^2 + 70y^2$
(c) $26z^2 + 82y^2$ (d) $30z^2 + 83y^2$

189. Simplify the given expression.

$$\frac{0.09\times0.09+0.04\times0.04+0.16\times0.16+2\times0.09\times0.04+2\times0.04\times0.16+2\times0.09\times0.16}{0.3\times0.3+0.2\times0.2+0.4\times0.4}$$

SSC CHSL 02/08/2023 (Shift-04)

(a) 0.38 (b) 0.24
(c) 0.32 (d) 0.29

190. Simply the following expression.

0.01 + 0.68 × 0.68 + 0.22 × 0.22 + 0.044 + 0.0136 + 0.44 × 0.68 =?

SSC CHSL 03/08/2023 (Shift-01)

(a) 0.69 (b) 1
(c) 0.8 (d) 0.9

191. The value of

$$\frac{0.325\times0.325+0.175\times0.175+25\times0.00455}{5\times0.0065\times3.25-7\times0.175\times0.025}-\frac{0.5}{1.5}$$

SSC CPO 23/11/2020 (Shift-02)

(a) 3 (b) 0
(c) –1 (d) –3

192. The value of

$\frac{1}{4}+\frac{[(20.35)^2-(8.35)^2]\times0.0175}{(1.05)^2+(1.05)(27.65)}$ is

SSC CGL Tier-II 29/01/20

(a) $\frac{3}{10}$ (b) $\frac{9}{20}$
(c) $\frac{7}{20}$ (d) $\frac{3}{20}$

193. Simplify $\frac{2.5\times2.5+0.3\times0.3+5\times0.3}{1.6\times1.6+0.6\times0.6-1.2\times1.6}$

SSC MTS 19/05/2023 (Shift-0

(a) 7.64 (b) 8.64
(c) 2.8 (d) 7.84

194. Simplify the following

$25^3 - 75^3 + 50^3$

SSC CGL 05/12/2022 (Shift-0

(a) –281250 (b) 281350
(c) 271250 (d) –281450

195. Simplify the given expression

$(1 + x)^3 + (1 - x)^3 + (-2)^3$

SSC CPO 04/10/2023 (Shift-0

(a) $3(1-x^2)$ (b) $6(1-x^2)$
(c) $-6(1-x^2)$ (d) $-3(1-x^2)$

196. Simplify: $\frac{(0.83)^3-(0.1)^3}{(0.83)^2+0.083+0.01}=?$

SSC CHSL 14/08/2023 (Shift-0

(a) 0.98 (b) 0.27
(c) 0.93 (d) 0.73

197. Simplify

$$\frac{(8.3)^3+(9.2)^3+(6.1)^3-3\times8.3\times9.2\times6.1}{(8.3)^2+(9.2)^2+(6.1)^2-8.3\times9.2-9.2\times6.1-6.1\times8.3}$$

SSC CGL 09/09/2024 (Shift-0

(a) 30.2 (b) 23.6
(c) 28.7 (d) 25.5

198. Simplify

$$\frac{(4.2)^3-(1.2)^3}{(4.2)^2+5.04+(1.2)^2}$$

SSC CGL 11/09/2024 (Shift-0

(a) 2 (b) 3
(c) 1 (d) 5

199. Simplify. $\frac{(7.3)^3-(4.7)^3}{(7.3)^2+7.3\times4.7+(4.7)^2}$

SSC CGL 18/09/2024 (Shift-0

(a) 12 (b) 3.2
(c) 2.6 (d) 11

200. Simplify

$$\frac{(232)^3+(140)^3+(353)^3-3\times232\times140\times353}{(232)^2+(140)^2+(353)^2-232\times140-140\times353-353\times23}$$

SSC CGL 23/09/2024 (Shift-0

(a) 261 (b) 725
(c) 445 (d) 596

201. Find the value of:

$$\frac{(453\times453\times453-383\times383\times383)}{(453\times383+383\times383+453\times453)}$$

SSC CGL 24/09/2024 (Shift-0

(a) 60 (b) 50
(c) 80 (d) 70

202. The value of

$$\frac{(275\times275\times275+725\times725\times725)}{(275\times275+725\times725-725\times275)}\times\frac{(275\times275\times275-725\times725\times725)}{(275\times275+725\times725+725\times275)}$$ is

SSC CPO 29/06/2024 (Shift-02)

(a) –450000 (b) 45000
(c) 450000 (d) –45000

203. Simplify the following expression:

$$\frac{(8.25)^3-3\times(8.25)^2\times0.25+24.75\times(0.25)^2-(0.25)^3}{4\times4\times4}$$

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 8 (b) 6
(c) 4 (d) 2

204. Simplify the given expression:

$$\frac{(2.3)^3+(15.9)^3+(3.7)^3-3\times2.3\times15.9\times3.7}{(2.3)^2+(15.9)^2+(3.7)^2-2.3\times15.9-15.9\times3.7-3.7\times2.3}$$

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 17.6 (b) 14.5
(c) 20.9 (d) 21.9

205. Simplify the given expression:

$$\frac{12.43\times12.43\times12.43+19.57\times19.57\times19.57}{12.43\times12.43-12.43\times19.57+19.57\times19.57}$$

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 34 (b) 30
(c) 32 (d) 36

206. Simplify the expression:
15 × 15 × 15 + 3 × 15 × 12 × 12 – 3 × 15 × 15 × 12 – 12 × 12 × 12

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 36 (b) 9
(c) 18 (d) 27

207. Simplify the following
$(x-3y)^3+27(y^3-xy^2)$

SSC Phase-XII 21/06/2024 (Shift-02)

(a) x^3-3x^2y
(b) x^3-9x^2y
(c) $x^3-27y^3-9x^2y$
(d) $x^3-27y^3-9x^2y+27xy^2+27y^3-27y^3$

208. Simplify the given expression.

$$\frac{[1.5\times1.5\times1.5+2.7\times2.7\times2.7+4.8\times4.8\times4.8-3\times1.5\times2.7\times4.8]}{[1.5\times1.5+2.7\times2.7+4.8\times4.8-1.5\times2.7-2.7\times4.8-4.8\times1.5]}$$

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 10 (b) 12
(c) 14 (d) 9

209. Simplify the expression:
$(0.2)^3+(0.3)^3+(0.5)^3+3\times0.5\times0.7\times0.8$

SSC Phase-XII 26/06/2024 (Shift-02)

(a) 0.005 (b) 0.001
(c) 1.000 (d) 1.525

210. Simplify the given expression

$$\frac{(3.254\times3.254\times3.254)-(0.746\times0.746\times0.746)}{(3.254\times3.254)+(0.746\times0.746)+(3.254\times0.746)}$$

SSC CPO 04/10/2023 (Shift-02)

(a) 2.508 (b) 4.508
(c) 2.146 (d) 3.156

211. Simplify

$$\frac{(3.321)^3+(2.681)^3+(1.245)^3-3\times3.321\times2.681\times1.1245}{(3.321)^2+(2.681)^2+(1.245)^2-(3.321\times2.681)-(2.681\times1.245)-(1.245)\times3.321}$$

SSC CHSL 04/08/2023 (Shift-01)

(a) 6.125 (b) 8.645
(c) 7.247 (d) 10.245

212. Simplify the given expression.

$$\frac{(80\times80\times80)+(70\times70\times70)+(50\times50\times50)-840000}{6400+4900+2500-5600-3500-4000}$$

SSC CHSL 10/08/2023 (Shift-01)

(a) 100 (b) 200
(c) 400 (d) 300

213. Simplify: $(a^{-1}+b^{-1})\div(a^{-3}+b^{-3})$

SSC CHSL 09/06/2022 (Shift-03)

(a) $\frac{ab}{(a^2-ab+b^2)}$ (b) $\frac{a^3b^3}{(a^2-ab+b^2)}$
(c) $\frac{a^2b^2}{(a^2+ab+b^2)}$ (d) $\frac{a^2b^2}{(a^2-ab+b^2)}$

214. Simplify

$$\frac{0.58\times0.58\times0.58-0.001}{0.58\times0.58+0.058+0.01}$$

SSC CGL 10/09/2024 (Shift-02)

(a) 0.48 (b) 0.28
(c) 0.37 (d) 0.42

215. Simplify

$$\frac{1.5\times1.5+2.5\times2.5+3.5\times3.5+2\times1.5\times2.5+2\times2.5\times3.5+2\times1.5\times3.5}{1.5+2.5+3.5}$$

SSC CGL 13/09/2024 (Shift-03)

(a) 9.5 (b) 6.5
(c) 8.5 (d) 7.5

• TYPE – III •
COMPARISON OF FRACTION

216. Arrange the given ratios in descending order 15 : 7, 5 : 11 and 21 : 77.

SSC CPO 11/11/2022 (Shift-02)

(a) 21 : 77 > 5 : 11 > 15 : 7
(b) 15 : 7 > 5 : 11 > 21 : 77
(c) 15 : 7 > 21 : 77 > 5 : 11
(d) 5 : 11 > 15 : 7 > 21 : 77

217. Find the correct descending order of the following ratios.
$\frac{17}{30}, \frac{7}{15}, \frac{27}{50}, \frac{11}{20}$

SSC CHSL Tier-II 26/06/2023

(a) $\frac{11}{20} > \frac{17}{30} > \frac{27}{50} > \frac{7}{15}$
(b) $\frac{17}{30} > \frac{11}{20} > \frac{27}{50} > \frac{7}{15}$
(c) $\frac{17}{30} > \frac{27}{50} > \frac{11}{20} > \frac{7}{15}$
(d) $\frac{7}{15} > \frac{11}{20} > \frac{27}{50} > \frac{17}{30}$

218. Which fraction among the following is the least?
$\frac{5}{11}, \frac{7}{12}, \frac{8}{13}, \frac{9}{17}$

SSC CGL Tier-II 08/08/2023

(a) $\frac{8}{13}$ (b) $\frac{5}{11}$
(c) $\frac{9}{17}$ (d) $\frac{7}{12}$

219. Arrange the following ratios in ascending order.
3 : 4, 3 : 5, 2 : 11, 7 : 2

SSC CPO 28/06/2024 (Shift-03)

(a) 3 : 5 < 2 : 11 < 3 : 4 < 7 : 2
(b) 7 : 2 < 3 : 4 < 3 : 5 < 2 : 11
(c) 2 : 11 < 3 : 5 < 3 : 4 < 7 : 2
(d) 3 : 4 < 3 : 5 < 2 : 11 < 7 : 2

• TYPE – IV •
LADDER FRACTION

220. The value of the following is:

$$1-\cfrac{7}{1-\cfrac{1}{1+\cfrac{7}{1-7}}}$$

SSC CPO 27/06/2024 (Shift-02)

(a) 2 (b) 0
(c) 1 (d) –1

221. The value of: $1-\cfrac{1}{1+\cfrac{1}{2-\cfrac{1}{2+\cfrac{1}{3}}}}$

SSC CPO 28/06/2024 (Shift-01)

(a) $\frac{7}{15}$ (b) $\frac{3}{16}$
(c) $\frac{7}{18}$ (d) $\frac{3}{11}$

222. What value of 'y' will satisfy the following equation?

$$\cfrac{3y}{1+\cfrac{1}{1+\cfrac{y}{1-y}}}=2$$

SSC CGL 25/07/2023 (Shift-01)

(a) $\frac{2}{3}$ (b) $\frac{5}{4}$
(c) $\frac{4}{5}$ (d) $\frac{3}{2}$

223. What is the simplified value of

$$4-\cfrac{2}{1+\cfrac{2}{1-\cfrac{1}{2+\cfrac{3}{4}}}}+1\frac{5}{12}\text{ of }\frac{72}{145}-(4+3+0.5-1)$$

SSC MTS 20/10/2021 (Shift-02)

(a) –4
(b) 1
(c) 3
(d) –2

224. If $\cfrac{1}{x+\cfrac{1}{y+\cfrac{2}{z+\cfrac{1}{4}}}}=\frac{29}{79}$, where x, y and z are natural number then the value of $(2x+3y-z)$ is:

SSC CGL Tier-II 16/11/2020

(a) 1
(b) 4
(c) 0
(d) 2

• TYPE – V •
BASED ON BAR

225. The value of $11.\bar{4}+22.5\overline{67}-33.5\bar{9}$ is:

SSC CGL Tier-II 03/02/2022

(a) $40.\overline{12}$
(b) $4.\overline{12}$
(c) $0.4\overline{12}$
(d) $0.04\overline{12}$

226. The value of

$0.4\bar{6}+0.7\overline{23}-0.3\bar{9}\times0.\bar{7}$ is:

SSC CGL Tier-II 29/01/2022

(a) $0.\overline{97}$
(b) $0.\overline{87}$
(c) $0.\overline{57}$
(d) $0.\overline{77}$

227. If A = $0.3\overline{12}$, B = $0.4\overline{15}$ and C = $0.30\bar{9}$, then what is the value of A + B + C?

SSC CGL Tier-II (08/08/2022)

(a) $\frac{1211}{1100}$
(b) $\frac{1043}{1100}$
(c) $\frac{1097}{1100}$
(d) $\frac{1141}{1100}$

• TYPE – VI •
CONTINUOUS FRACTION SERIES

228. Which of the following statement is true?

I. $\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\dots\dots\frac{1}{110}<\frac{5}{6}$

II. $\frac{1}{3}+\frac{1}{15}+\frac{1}{35}+\dots\dots\frac{1}{143}>\frac{7}{13}$

SSC CHSL 13/03/2023 (Shift-04)

(a) Only I
(b) Both I and II
(c) Only II
(d) Neither I nor II

229. Which of the following statement is true?

I. $\frac{1}{2}+\frac{1}{6}+\frac{1}{12}=\frac{3}{4}$

II. $\frac{1}{6}+\frac{1}{12}+\frac{1}{20}=\frac{3}{5}$

SSC CHSL 20/03/2023 (Shift-02)

(a) Neither I nor II
(b) Only II
(c) Only I
(d) Both I and II

230. What is the value of

$\frac{7}{2}+\frac{11}{3}+\frac{7}{6}+\frac{11}{15}+\frac{7}{12}+\frac{11}{35}+\dots\dots+\frac{7}{156}+\frac{11}{575}$?

SSC CGL Tier-II 08/08/2022

(a) $\frac{3216}{315}$
(b) $\frac{3816}{325}$
(c) $\frac{3917}{355}$
(d) $\frac{3714}{345}$

231. The value of $\frac{3}{70}+\frac{1}{42}+\frac{1}{66}+\frac{3}{286}+\frac{1}{130}+\frac{1}{170}$ is:

SSC CGL Tier-II 03/02/2022

(a) $\frac{7}{85}$
(b) $\frac{3}{85}$
(c) $\frac{11}{85}$
(d) $\frac{9}{85}$

232. Simplify

$\frac{4}{3\times7}+\frac{6}{7\times13}+\frac{8}{13\times21}+\frac{10}{21\times31}+\frac{12}{31\times43}$

SSC CHSL 17/03/2020 (Shift-01)

(a) $\frac{39}{128}$
(b) $\frac{40}{129}$
(c) $\frac{41}{130}$
(d) $\frac{42}{135}$

233. Simplify $\frac{1}{8}+999\frac{791}{792}\times99$

(a) 89000
(b) 88900
(c) 95900
(d) 99000

• TYPE – VII •
CONCEPT OF AP & GP

234. What is the value of the expression 1 – 2 + 3 – 4 + 5 – 6 .... to 100 terms?

SSC CHSL 09/03/2023 (Shift-02)

(a) –50
(b) –55
(c) –49
(d) –60

235. What is the value of $4^2-3^2+6^2-5^2+8^2-7^2+\dots\dots\dots\dots92^2-91^2$?

SSC CHSL 21/03/2023 (Shift-03)

(a) 4272
(b) 4280
(c) 4278
(d) 4275

236. What is the value of $98^2-97^2+96^2-95^2+94^2-93^2+\dots\dots\dots12^2-11^2$?

SSC CHSL 17/03/2023 (Shift-04)

(a) 4725
(b) 4796
(c) 4851
(d) 4926

SURDS & INDICES

• TYPE – VIII •
BASIC QUESTIONS

237. What is the simplified value of $(0.00243)^{(0.2)}$?

SSC CPO 10/11/2022 (Shift-01)

(a) 0.3
(b) 0.03
(c) 0.003
(d) 0.0003

238. Simplify: $\sqrt{[(7^2+6^3+9^2)\div2+52]}$

SSC MTS 16/05/2023 (Shift-01)

(a) 14
(b) 15
(c) 16
(d) 13

239. What is the positive value of the following expression?

$$\sqrt{36\div15\text{ of }2\text{ of}\left[\begin{matrix}25\times4\div4\text{ of}\\ \left\{\begin{matrix}29-(8-11)\div\\(9\times5\div5\text{ of }3)\end{matrix}\right\}\end{matrix}\right]}$$

SSC CPO 11/11/2022 (Shift-02)

(a) $1\frac{5}{6}$
(b) $1\frac{1}{5}$
(c) $2\frac{4}{5}$
(d) $2\frac{3}{5}$

240. Simplifying the following expression

$$\frac{24\sqrt{45}-16\sqrt{20}+\sqrt{245}-47\sqrt{5}}{3\frac{1}{5}+1\frac{2}{5}-2\frac{1}{6}-2\frac{1}{5}-5\frac{2}{5}+3\frac{1}{6}}$$

SSC MTS 08/09/2023 (Shift-02)

(a) 3
(b) 1
(c) 2
(d) 0

241. If a, b, c are positive real numbers, what is the value of $\sqrt{a^{-1}b}\times\sqrt{b^{-1}c}\times\sqrt{c^{-1}a}$?

SSC CHSL 03/06/2022 (Shift-03)

(a) 2
(b) 3
(c) 1
(d) 4

242. If $\sqrt{1+\frac{\sqrt{3}}{2}}-\sqrt{1-\frac{\sqrt{3}}{2}}=C$, then the value of C is:

SSC CGL Tier-II 03/02/2023

(a) 1
(b) 4
(c) 3
(d) 2

243. $\frac{\sqrt[3]{6859}}{\sqrt[4]{1296}}\times\frac{3}{57}\times42=?$

SSC CGL TIER-II (18/01/2025)

(a) 7
(b) 16
(c) –3
(d) 17

• TYPE – IX •
TO FIND SMALLEST/LARGEST

244. Which one among the following is the smallest?

SSC CPO 09/12/2019 (Shift-01)

(a) $\sqrt{101}-\sqrt{99}$ (b) $\sqrt{201}-\sqrt{199}$

(c) $\sqrt{301}-\sqrt{299}$ (d) $\sqrt{401}-\sqrt{399}$

245. Which one among $\sqrt[3]{6}, \sqrt[4]{5}$ and $\sqrt[6]{12}$ is the largest?

(a) $\sqrt[3]{6}$ (b) $\sqrt[4]{5}$

(c) $\sqrt[6]{12}$ (d) All are equal

246. The greatest among the numbers $\sqrt{0.09}, \sqrt[3]{0.064}$, 0.5 and $\frac{3}{5}$ is:

(a) $\sqrt{0.09}$ (b) $\frac{3}{5}$

(c) 0.5 (d) $\sqrt[3]{0.064}$

247. Which value among $\sqrt{11}+\sqrt{5}$, $\sqrt{14}+\sqrt{2}$, $\sqrt{8}+\sqrt{8}$ is the largest?

(a) $\sqrt{11}+\sqrt{5}$ (b) $\sqrt{14}+\sqrt{2}$

(c) $\sqrt{8}+\sqrt{8}$ (d) All are equal

248. Which of the following given value is greater than $\sqrt[3]{12}$?

SSC CGL Tier-II (08/08/2022)

(a) $\sqrt[5]{60}$ (b) $\sqrt[12]{33214}$

(c) $\sqrt[6]{121}$ (d) $\sqrt[9]{1500}$

• TYPE – X •
INFINITE SERIES

249. Find the value of $\sqrt{a\sqrt{a\sqrt{a\sqrt{a}}}}$

(a) $a^{\frac{7}{8}}$ (b) $a^{\frac{15}{16}}$

(c) a (d) a^1

250. Find the value of

$$\sqrt{30+\sqrt{30+\sqrt{30+\sqrt{30+\ldots\infty}}}}$$

(a) 3 (b) 4

(c) 5 (d) 6

251. What is the value of :

$$\left(\sqrt{72-\sqrt{72-\sqrt{72-\ldots\infty}}}\right) \div \left(\sqrt{20-\sqrt{20-\sqrt{20-\ldots\infty}}}\right)$$

(a) 4 (b) 2

(c) 3.6 (d) 8

252. $\sqrt{5+\sqrt{5+\sqrt{5+\ldots\infty}}} = ?$

(a) $\frac{\sqrt{21}+1}{2}$ (b) $\frac{\sqrt{21}-1}{2}$

(c) $\frac{\sqrt{21}+3}{2}$ (d) $\frac{\sqrt{21}-3}{2}$

253. Find $\sqrt{19-\sqrt{19-\sqrt{19-\sqrt{19\ldots\infty}}}} = ?$

(a) $\frac{\sqrt{77}-1}{2}$ (b) $\frac{\sqrt{19}+3}{2}$

(c) $\frac{\sqrt{77}+1}{2}$ (d) Between 4 & 5

254. If $P = \sqrt{11+3\sqrt{11+3\sqrt{11+3\sqrt{11-\ldots\infty}}}}$ and $Q = \sqrt{11-3\sqrt{11-3\sqrt{11-3\sqrt{11-\ldots\infty}}}}$ then P + Q = ?

(a) $\sqrt{47}$ (b) $\sqrt{65}$

(c) $\sqrt{41}$ (d) $\sqrt{53}$

255. $\sqrt{7+2\sqrt{7-2\sqrt{7+2\sqrt{7-2\sqrt{7+\ldots}}}}} = ?$

(a) $\sqrt{51}$ (b) 4

(c) $\frac{3+\sqrt{15}}{2}$ (d) 3

256. Let $x = \sqrt{6-\sqrt{6+\sqrt{6-\sqrt{6+\ldots}}}}$ to infinity ; then x equals

(a) 3 (b) $\sqrt{21}$

(c) $\frac{\sqrt{21}-1}{2}$ (d) $\frac{\sqrt{21}+1}{2}$

• TYPE – XI •
SQUARE ROOT IN DENOMINATOR

257. Find the value of $\frac{\sqrt{1.24}\times\sqrt{2.79}}{\sqrt{2.64}\times\sqrt{5.94}}$

SSC CGL Tier-II 26/10/2023

(a) $\frac{31}{44}$ (b) $\frac{33}{64}$

(c) $\frac{31}{66}$ (d) $\frac{33}{31}$

258. Evaluate $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, given that $\sqrt{6} = 2.45$

SSC CHSL 08/08/2023 (Shift-04)

(a) 7.7 (b) 9.9

(c) 8.8 (d) 6.6

259. What is the value of

$$\frac{\sqrt{29.16}}{\sqrt{1.1664}}+\frac{\sqrt{0.2916}}{\sqrt{116.64}}+\frac{\sqrt{0.0036}}{\sqrt{0.36}}?$$

SSC CGL Tier-II (08/08/2022)

(a) $\frac{101}{20}$ (b) $\frac{103}{20}$

(c) $\frac{26}{5}$ (d) $\frac{27}{5}$

260. What is the value of

$$\frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}}\times\frac{\sqrt{14}-\sqrt{10}}{\sqrt{14}+\sqrt{10}}+\frac{\sqrt{10}}{\sqrt{5}}?$$

SSC CGL Tier-II (08/08/2022)

(a) $\sqrt{2}+1$ (b) $2\sqrt{2}+2$

(c) $\sqrt{2}+2$ (d) $2\sqrt{2}+1$

261. If $\sqrt{5} = 2.24$ then find the value of

$$\sqrt{\frac{\sqrt{5}-1}{\sqrt{5}+1}}$$

SSC Phase-X 04/08/2022 (Shift-04)

(a) 0.62 (b) 0.59

(c) 0.68 (d) 0.55

262. If $A = \frac{\sqrt{0.0004}\times\sqrt[3]{0.000008}}{\sqrt[4]{16000}\times\sqrt[3]{125000}\times\sqrt[4]{810}}$ and $B = \frac{\sqrt[3]{0.729}\times\sqrt[4]{0.0016}}{\sqrt{0.16}}$, then what is A × B?

SSC CGL Tier-II (08/08/2022)

(a) 6×10^{-8} (b) 7×10^{-7}

(c) $\left(\frac{7}{4}\right)\times10^{-8}$ (d) $\left(\frac{7}{3}\right)\times10^{-7}$

263. If $\frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{3+\sqrt{5}}} = a + \sqrt{5}b$, with a, b > 0, then what is the value of (ab) : (a + b)?

SSC CGL Tier-II 29/01/2022

(a) 8 : 7 (b) 4 : 7

(c) 7 : 8 (d) 7 : 4

264. The value of

$$\frac{1}{\sqrt{16}-\sqrt{15}}-\frac{1}{\sqrt{15}-\sqrt{14}}+\frac{1}{\sqrt{14}-\sqrt{13}}-\frac{1}{\sqrt{13}-\sqrt{12}}+\frac{1}{\sqrt{12}-\sqrt{11}}-\frac{1}{\sqrt{11}-\sqrt{10}}+\frac{1}{\sqrt{10}-3}-\frac{1}{3-\sqrt{8}}$$ is:

SSC CGL Tier-II 29/01/2022

(a) $2+2\sqrt{2}$ (b) $2-2\sqrt{2}$

(c) $4-2\sqrt{2}$ (d) $4+2\sqrt{2}$

265. $\frac{8\sqrt{5}}{\sqrt{10}-\sqrt{2}}-\frac{5\sqrt{2}}{\sqrt{10}-\sqrt{5}}-\frac{3\sqrt{10}}{\sqrt{2}-\sqrt{5}}+\frac{1}{2-\sqrt{2}} = a + b\sqrt{2}$ then (15a – 2b) value is equal to

(a) 3 (b) – 6

(c) 6 (d) –3

266. If $\frac{\sqrt{26-7\sqrt{3}}}{\sqrt{14+5\sqrt{3}}} = \frac{b+a\sqrt{3}}{11}$ b > 0, then what is the value of $\sqrt{(b-a)}$?

SSC CGL Tier-II 03/02/2022

(a) 5 (b) 25

(c) 12 (d) 9

• TYPE – XII •
SIMPLIFICATION OF POWERS

267. Simplify: $9^{18} \div 3^{14}$ of $27^3 \times \sqrt{6561}$

SSC CPO 27/06/2024 (Shift-02)

(a) 3^{17} (b) 3^{16}

(c) 3^{15} (d) 3^{18}

268. Find the value of: $\left(\sqrt[3]{\sqrt[3]{343}}\right)^3 \times \left(\sqrt[3]{\sqrt[3]{216}}\right)^3$

SSC CHSL TIER-II 10/01/2024

(a) 42^3 (b) 56

(c) 42 (d) $\sqrt[3]{42}$

269. The value of $(0.3)^{[(200-146)/(3\times3\times3)]-3}$ is:

SSC CGL Tier-II 03/02/2022

(a) $\frac{10}{3}$ (b) $\frac{5}{3}$

(c) $\frac{7}{3}$ (d) $\frac{8}{3}$

ANSWER KEY

1.	(d)	2.	(b)	3.	(c)	4.	(b)	5.	(c)	6.	(b)	7.	(b)	8.	(b)	9.	(a)	10.	(d)
11.	(c)	12.	(a)	13.	(d)	14.	(a)	15.	(a)	16.	(c)	17.	(b)	18.	(d)	19.	(b)	20.	(c)
21.	(c)	22.	(d)	23.	(b)	24.	(a)	25.	(b)	26.	(c)	27.	(a)	28.	(c)	29.	(d)	30.	(b)
31.	(b)	32.	(d)	33.	(b)	34.	(a)	35.	(b)	36.	(c)	37.	(a)	38.	(a)	39.	(c)	40.	(b)
41.	(a)	42.	(a)	43.	(a)	44.	(b)	45.	(c)	46.	(c)	47.	(a)	48.	(b)	49.	(a)	50.	(a)
51.	(c)	52.	(a)	53.	(c)	54.	(a)	55.	(b)	56.	(b)	57.	(c)	58.	(d)	59.	(b)	60.	(a)
61.	(d)	62.	(b)	63.	(a)	64.	(d)	65.	(b)	66.	(c)	67.	(d)	68.	(d)	69.	(b)	70.	(d)
71.	(c)	72.	(c)	73.	(c)	74.	(b)	75.	(d)	76.	(b)	77.	(d)	78.	(d)	79.	(c)	80.	(c)
81.	(c)	82.	(d)	83.	(c)	84.	(d)	85.	(c)	86.	(c)	87.	(b)	88.	(d)	89.	(a)	90.	(a)
91.	(b)	92.	(b)	93.	(d)	94.	(b)	95.	(b)	96.	(a)	97.	(a)	98.	(a)	99.	(d)	100.	(d)
101.	(a)	102.	(c)	103.	(c)	104.	(a)	105.	(b)	106.	(c)	107.	(d)	108.	(b)	109.	(d)	110.	(d)
111.	(c)	112.	(a)	113.	(b)	114.	(d)	115.	(a)	116.	(a)	117.	(b)	118.	(b)	119.	(b)	120.	(b)
121.	(b)	122.	(b)	123.	(d)	124.	(b)	125.	(a)	126.	(b)	127.	(a)	128.	(c)	129.	(b)	130.	(c)
131.	(b)	132.	(c)	133.	(a)	134.	(a)	135.	(c)	136.	(c)	137.	(a)	138.	(c)	139.	(d)	140.	(a)
141.	(a)	142.	(a)	143.	(a)	144.	(a)	145.	(d)	146.	(a)	147.	(d)	148.	(d)	149.	(c)	150.	(a)
151.	(b)	152.	(a)	153.	(c)	154.	(b)	155.	(d)	156.	(b)	157.	(a)	158.	(d)	159.	(a)	160.	(c)
161.	(d)	162.	(d)	163.	(a)	164.	(d)	165.	(a)	166.	(d)	167.	(d)	168.	(a)	169.	(a)	170.	(a)
171.	(a)	172.	(c)	173.	(a)	174.	(d)	175.	(b)	176.	(a)	177.	(d)	178.	(b)	179.	(c)	180.	(d)
181.	(b)	182.	(a)	183.	(b)	184.	(d)	185.	(c)	186.	(a)	187.	(a)	188.	(a)	189.	(d)	190.	(b)
191.	(a)	192.	(b)	193.	(d)	194.	(a)	195.	(c)	196.	(d)	197.	(b)	198.	(b)	199.	(c)	200.	(b)
201.	(d)	202.	(a)	203.	(a)	204.	(d)	205.	(c)	206.	(d)	207.	(b)	208.	(d)	209.	(c)	210.	(a)
211.	(c)	212.	(b)	213.	(d)	214.	(a)	215.	(d)	216.	(b)	217.	(b)	218.	(b)	219.	(c)	220.	(b)
221.	(c)	222.	(c)	223.	(a)	224.	(d)	225.	(c)	226.	(b)	227.	(d)	228.	(d)	229.	(c)	230.	(b)
231.	(d)	232.	(b)	233.	(d)	234.	(a)	235.	(d)	236.	(b)	237.	(a)	238.	(b)	239.	(b)	240.	(d)
241.	(c)	242.	(a)	243.	(a)	244.	(d)	245.	(b)	246.	(b)	247.	(c)	248.	(b)	249.	(b)	250.	(d)
251.	(b)	252.	(a)	253.	(a)	254.	(d)	255.	(d)	256.	(c)	257.	(c)	258.	(b)	259.	(b)	260.	(a)
261.	(a)	262.	(a)	263.	(c)	264.	(c)	265.	(b)	266.	(a)	267.	(a)	268.	(c)	269.	(a)		

SPEED BOOSTER HACKS

◆ Square of two digit number ◆

+ Carry + Carry

$$(ab)^2 = a^2 / 2ab / b^2$$

1 digit

1 digit

- **Square of 14**

Here, a = 1 & b = 4

$14^2 = 1^2/2.1.4/4^2 = 1/8/16 = 196$

- **Square of 23**

Here, a = 2 & b = 3

$23^2 = 2^2/2.2.3/3^2 = 4/12/9 = 529$

◆ Do it Yourself ◆

(i) 18^2 = ... (ii) 23^2 = ...

(iii) 27^2 = ... (iv) 34^2 = ...

(v) 38^2 = ... (vi) 43^2 = ...

(vii) 57^2 = ... (viii) 64^2 = ...

(ix) 66^2 = ... (x) 75^2 = ...

(xi) 78^2 = ... (xii) 84^2 = ...

SOLUTIONS

1. (d) $25 - (18 - 4 \times 9 \div 3)$
$= 25 - (18 - 12) = 25 - 6 = 19$

2. (b) $626 \times 2912 \div 8138$
$= 626 \times \frac{2912}{8138} = \frac{2912}{13} = 224$

3. (c) $4 \times 7 - 3\{7 \times 4 \div (6 \times 2)\}$
$= 28 - 3\{7 \times 4 \div 12\}$
$= 28 - 3 \times \frac{7}{3} = 21$

4. (b) $18 \div (14 - 5) \times 5 \times 24 \div 30$
$= 2 \times 5 \times \frac{24}{30} = 8$

5. (c) $3 + 28 \div 35 \times 15 + 4 - 3 \times 4$
$= 3 + \frac{4}{5} \times 15 - 8$
$= 3 + 12 - 8 = 7$

6. (b) $25 \div 5 \times 7 \text{ of } (5 + 7) - 13(6 \times 4)$
$= 25 \div 5 \times 7 \text{ of } 12 - 13 \times 24$
$= 25 \div 5 \times 84 - 312$
$= 5 \times 84 - 312$
$= 420 - 312 = 108$

7. (b) $5055 - (1002 \div 20.04)$
$= 5055 - 50 = 5005$

8. (b) $9 \times 9 + 9 \div 9 - 9 \times 9 + 9 + 9 \times 9 - 9 - 9 \times 9$
$= 81 + 1 - 81 + 9 + 81 - 9 - 81 = 1$

9. (a) $(4^2)^2 + 4 \times 4 \div 4 - 4$
$= 256 + 4 - 4$
$= 256 = 4^4$

10. (d) $21 - 4.9 \div 7 + 3.9 \times 0.4 + 0.9$
$= 21 - 0.7 + 1.56 + 0.9$
$= 22.76$

11. (c) $21 - [6 + 7 - \{3.22 - (1.1 \times 0.2)\}]$
$= 21 - [6 + 7 - \{3.22 - 0.22\}]$
$= 21 - [6 + 7 - 3] = 21 - [10] = 11$

12. (a) $15.5 - [3 - \{7 - (5 - 14.5 + 13.5)\}]$
$= 15.5 - [3 - \{7 - (5 - 1)\}]$
$= 15.5 - [3 - \{7 - 4\}]$
$= 15.5 - [3 - 3] = 15.5$

13. (d)
$-7 + [5 + 1 \div 2 - \{4 + (4 \text{ of } 2 \div 4) + (4 \div 4 \text{ of } 2)\}]$
$= -7 + [5 + 1 \div 2 - \{(4 + 2) + (\frac{1}{2})\}]$
$= -7 + \left[5 + 1 \div 2 - \frac{13}{2}\right]$
$= -7 + (-1) = 7$

14. (a) $7.5 \times 17.2 \div 8.6 + (59.5) \text{ of } \frac{1}{17} - \frac{7}{2} \text{ of } 5$
$= 7.5 \times \frac{17.2}{8.6} + 59.5 \times \frac{1}{17} - \frac{7}{2} \times 5$
$= 7.5 \times \frac{17.2}{8.6} + 3.5 - \frac{35}{2}$
$= 15 + 3.5 - 17.5$
$= 18.5 - 17.5 = 1$

15. (a) $5 + 24 \times 8 \div 8 \text{ of } 8 - 8 \div 8 \times 4 \text{ of } 4$
$= 5 + 24 \times \frac{8}{64} - \frac{8}{8} \times 16 = 5 + 3 - 16 = 8 - 16 = -8$

16. (c) $13 - [7 - (4 + 7) - \{7 - (7 - 4 + 7)\} + 14]$
$= 13 - [-4 - \{7 - 10\} + 14]$
$= 13 - [-4 + 3 + 14]$
$= 0$

17. (b) $15 \div 3 \text{ of } 2 \times 2 + 9 \div 18 \text{ of } 2 \times 4 - 4 \div 8 \times 2$
$= 15 \div 6 \times 2 + 9 \div 36 \times 4 - \frac{4}{8} \times 2$
$= \frac{15 \times 2}{6} + \frac{1}{4} \times 4 - 1$
$= 5 + 1 - 1 = 5$

18. (d) $45 \div 3 + 4 \times A - 48 \div 24 + 4 = 1$
$\Rightarrow 15 + 4A - 2 + 4 = 1$
$\Rightarrow 17 + 4A = 1 \Rightarrow 4A = -16 \Rightarrow A = -4$

19. (b) $[(70 - 60 \div 2 \text{ of } 6) + (20 - 10) \div 10] + 600 \div 25 \text{ of } (2 \times 3) \times (2 \text{ of } 3) + 2 \text{ of } 5$
$= [(70 - 5) + 1] + 600 \div 25 \text{ of } 6 \times 6 + 10$
$= 66 + 4 \times 6 + 10$
$= 66 + 34 = 100$

20. (c) $16 \div 2 - 7 \times 15 \div 3 + 5 \times 5 + 4 \times 3 - 10$
$= 8 - 7 \times 5 + 25 + 12 - 10$
$= 8 - 35 + 37 - 10$
$= 45 - 45$
$= 0$

21. (c) $9 - 5 \times 6 + \{29 - (7 - 2)\} \div 8$
$= 9 - 30 + \{29 - 5\} \div 8 = 9 - 30 + 3$
$= -18$

22. (d) $25 \div 5 + 3 \text{ of } 2 - 4 + 6 \text{ of } 3 \div 2 - 8 + 4$
$= 5 + 6 - 4 + 9 - 8 + 4 = 12$

23. (b) $[15 \div 3 \times 7 - 8 \text{ of } 2 + 6]$
$= [5 \times 7 - 16 + 6] = 35 - 10 = 25$

24. (a) $6 \times [28 \div 84 \times \{36 \times 49 \div (6 \times 7)\}]$
$= 6 \times \left[\frac{28}{84} \times \left\{36 \times \frac{49}{42}\right\}\right]$
$= 6 \times \left[\frac{1}{3} \times 42\right]$
$= 6 \times 14 = 84$

25. (b) $0.07 \times 0.28 \div 0.04 + 0.64 - 1.64 \div 0.04$
$= \frac{7}{100} \times \frac{28}{100} \div \frac{4}{100} + \frac{64}{100} - \frac{164}{100} \div \frac{4}{100}$
$= \frac{7}{100} \times \frac{28}{100} \times \frac{100}{4} + \frac{64}{100} - \frac{164}{100} \times \frac{100}{4}$
$= \frac{49}{100} + \frac{64}{100} - 41$
$= 1.13 - 41 = -39.87$

26. (c) $11 - \{(3 + 4) \text{ of } 8 - \overline{4 - 8}\}$
$= 11 - \{6 + 4\} = 11 - 10 = 1$

27. (a) $133 \div 19 \times 3 - 48 \times 2 \div 24 + 841 \div [\overline{(45 - 16)}]$
$= 21 - 4 + 841 \div 29$
$= 17 + 29$
$= 46$

28. (c) $[25 - 48 \div 6 + 12 \times 2] + 78 - [5 + 3 \text{ of } (25 - 2 \times 10)]$
$= [25 - 8 + 24] + 78 - [5 + 3 \text{ of } 5]$
$= 41 + 78 - 20 = 41 + 58 = 99$

29. (d) $9 \times N \text{ of } 4 \div 4 - 15 \times 4 = 12$
$\Rightarrow 9 \times 4N \div 4 - 60 = 12$
$\Rightarrow 9N = 72 \Rightarrow N = 8$

30. (b) $(60 + 64 \div 4 \text{ of } 4) \times [1000 \div \{10 \text{ of } (3 + 2) \times 2 \text{ of } 5\}] - 28 + (100 \times 3 \text{ of } 3)$
$= 64 \times 2 - 28 + 900$
$= 128 - 28 + 900 = 1000$

31. (b) $[40 - 48 \div 4 \text{ of } 3] \div \{(6 + 4) - 4 \text{ of } 4 + 4 + (6 - 4) + (4 \times 4) \div 4\} \times 3$
$= [40 - 4] \div \{10 - 16 + 4 + 2 + 4\} \times 3 = 36 \div 4 \times 3$
$= 9 \times 3 = 27$

32. (d) $8 - 5 \div 2^3 \times 3 + (7 \div 7 \times 7) \div 7 + (3 \times 6 \div \frac{1}{3}) \times \frac{1}{3^3}$
$= 8 - \frac{15}{8} + 1 + 54 \times \frac{1}{27}$
$= 8 - \frac{15}{8} + 1 + 2 = 11 - \frac{15}{8} = \frac{73}{8}$

33. (b) $640 \div 8 + 930 \div 15 - k + 32 \times 5 = 1104 \div 16 \times 148 \div 37$
$\Rightarrow 80 + 62 - k + 160 = 69 \times 4$
$\Rightarrow 142 - k + 160 = 276$
$\Rightarrow 302 - k = 276$
$\Rightarrow k = 26$

34. (a) $[3^3 \{(40 \times 5) + (7 \times 6)\} \div 11] + (2^3 \times 15 \div 24)$
$= [27\{200 + 42\} \div 11] + \left(2^3 \times \frac{5}{8}\right)$
$= [27 \times 242 \div 11] + 5$
$= [27 \times 22] + 5$
$= 599$

35. (b) $12 \div 4 \text{ of } 3 \times 6 + 8 \div 16 \text{ of } 4 \times 8 - 4 \div 6 \times 9$
$= 12 \div 12 \times 6 + 8 \div 64 \times 8 - \frac{2}{3} \times 9$
$= 6 + \frac{1}{8} \times 8 - \frac{2}{3} \times 9 = 6 + 1 - 6 = 1$

36. (c) $47 \times (10 \div 5) - (4 + 5) + 6$
$= 47 \times 2 - 9 + 6 = 91$

37. (a) $99 - [169 \div (13 \times 13) - (-4) - \{3 - 17 + 10\}]$
$= 99 - [1 + 4 - (-4)]$
$= 99 - [9] = 90.$

38. (a) $(3 - 3 \times 3 + 3 \div 3 + 3 \times 5) \times 2 \text{ of } 5 + (2 + 2 \div 2 + 2 \times 2 - 2)$
$= (3 - 9 + 1 + 15) \times 10 + (3 + 2)$
$= 100 + 5 = 105$

39. (c) $(45 + 9) \div 2 - 7 \times 33 \div 7 + \{(7 + 18) \times 6\} + 72 - 89$
$= 27 - 33 + 150 - 17 = 127$

40. (b) $(17 + 15) \div 2 - 11 + 16 \times 4 - 28 + 13(-16 + 13)$
$= 16 - 11 + 64 - 28 + 13(-3)$
$= 5 + 36 - 39 = 2$

41. (a)
$42 \div 3 + k \times 3 - 22 \div 11 + 4 = 28$
$\Rightarrow \frac{42}{3} + 3k - 2 + 4 = 28$
$\Rightarrow 14 + 3k = 28 - 2$
$\Rightarrow 3k = 12 \Rightarrow k = 4$

42. (a) $(36 \div 6) \div 3 + (18 \div 9) \times 4 - (12 \div 6) \times (5 \div 2)$
$= 6 \div 3 + 2 \times 4 - 2 \times \frac{5}{2}$
$= 10 - 5 = 5$

43. (a) $720 + 48 \div 8 \times$
$= 720 + 30 - 18 =$

44. (b) $12 \div 4$ of 3×6 .o of $4 \times 8 - 4 \div 6 \times 9$
$= 12 \div 12 \times 6 + 8 \div 64 \times 8 - \frac{2}{3} \times 9$
$= 6 + \frac{1}{8} \times 8 - \frac{2}{3} \times 9 = 6 + 1 - 6 = 1$

45. (c) $12 + 24 \div 2 - 7 \times 30 \div 6 + (5 + 4) \times 8 + 8 \div 8 - 8$
$= 12 + 12 - 35 + 72 - 7$
$= 96 - 42 = 54$

46. (c) $25 \times 25 + 9 \times 9 + 6 \times 6 + 2 \times 25 \times 9 + 2 \times 9 \times 6 + 2 \times 25 \times 6$
$\therefore a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = (a + b + c)^2$
$= (25 + 9 + 6)^2 = (40)^2 = 1600$

47. (a) $8.2 + 2.6 + 3.2 - 4.5 \div 0.9 \times 1.2$
$= 8.2 + 2.6 + 3.2 - 6 = 8$

48. (b) $5 \times [14 \div 13 \times \{13 \times 14 \div (14 \times 14)\}]$
$= 5 \times \left[14 \div 13 \times \left\{\frac{13}{14}\right\}\right]$
$= 5 \times \left[\frac{14}{13} \times \frac{13}{14}\right] = 5$

49. (a) $[\{38 - (-6) \times (9 - (8 - 1))\}] \div [4 \times \{6 + (-4)\}]$
$= [\{44 \times 2\}] \div [4 \times \{6 - 4\}]$
$= [88] \div [4 \times 2]$
$= 11$

50. (a) $[\{(82 + 48 \div 8 \times 3) + 5 \times 6\} - 7.5 \times 2]$
$= [\{100 + 30\} - 15]$
$= [130 - 15] = 115$

51. (c) $x[-5\{-4(-a)\}] + 6[-3\{-3(-a)\}] = 6a$
$\Rightarrow -20ax + (-54a) = 6a$
$\Rightarrow -20ax = 6a + 54a$
$\Rightarrow -20ax = 60a$
$\Rightarrow x = -3$

52. (a) $20 \div 5$ of $4 \times 8 + 6 \div 24$ of $3 \times 48 - 6 \div 18 \times 9.$
$= 1 \times 8 + 6 \div 72 \times 48 - 3$
$= 8 + \frac{6 \times 48}{72} - 3$
$= 5 + 4 = 9$

53. (c) $64 \div [44 - (8 \text{ of } 3 - 16) \div 4 \times 20]$
$= 64 \div [44 - 40]$
$= 64 \div 4 = 16$

54. (a) $66 \div [34 - (32 \text{ of } 2 - 4) \div (4 \times 15)]$
$= 66 \div [34 - 60 \div 60]$
$= 66 \div 33 = 2$

55. (b) $855 \div 15 - k + 32 \times 5 = 1152 \div 16 \times 111 \div 37$
$\Rightarrow 57 - k + 160 = 72 \times 3$
$\Rightarrow 217 - k = 216$
$\Rightarrow k = 1$

56. (b) 15% of $1.5 + 0.15 \div 0.1 + 0.01$ of $1.1 \times 0.5 + 2.5 \times 25.$
$= 0.225 + 1.5 + .0055 + 62.5$
$= 64.2305$

57. (c) $(6 + 6 \text{ of } 5 \div 5) \div 6 \text{ of } 5 + (24 \div 2 \text{ of } 3 - 6 \text{ of } 5 + 4)$
$= (6 + 6) \div 30 + (4 - 30 + 4)$
$= 12 \div 30 + (-22)$
$= \frac{12}{30} - 22 = -21\frac{3}{5}$

58. (d) $56 \div 4 + p \times 3 - 24 \div 12 + 4 = 21 \div 3 + 3$
$\Rightarrow 14 + 3p + 2 = 10 \Rightarrow 3p = -6 \Rightarrow p = -2$

59. (b) $22.0625 - [15 + 0.25 \times (4.78 - 1.5 \times 3.02)]$
$= 22.0625 - [15 + 0.25 (4.78 - 4.53)]$
$= 22.0625 - [15 + 0.25 \times 0.25]$
$= 22.0625 - 15.0625 = 7.0$

60. (a) $(4.2 \text{ of } 2.5 \div 3.5) - (3.6 \div 2.4 + 2.5 \text{ of } 3 \div 7.5) + (6 - 3 \text{ of } 2 + 4 \text{ of } 3 \div 6)$
$= \left(\frac{4.2 \times 2.5}{3.5}\right) - \left(\frac{3}{2} + \frac{7.5}{7.5}\right) + \left(6 - 6 + \frac{12}{6}\right)$
$= 3 - \frac{5}{2} + 2 = 5 - \frac{5}{2} = \frac{5}{2} = 2.5$

61. (d) $4 \times \frac{5}{20} \times 4 \div (6 + 6 \times 6 \div 6 \text{ of } 6 - 6 \div 6 \times 6)$
$= 4 \div (6 + 1 - 6)$
$= 4 \div 1 = 4$

62. (b) $7.2 \times \frac{1}{3} + \frac{9}{10} - \frac{1}{10}$
$= 2.4 + 0.8 = 3.2$

63. (a) $(12 + 18) \div 2 - 11 + 64 - 28 + 13(-3)$
$= 15 - 11 + 64 - 28 - 39$
$= 4 + 64 - 67 = 1$

64. (d) $12.3 - [7 + 0.8 \text{ of } (5.6 - 3.8 \times 1.03)]$
$= 12.3 - [7 + 0.8 \text{ of } (5.6 - 3.914)]$
$= 12.3 - [7 + 0.8 \text{ of } 1.686]$
$= 12.3 - [7 + 1.3488]$
$= 12.3 - 8.3488 - 3.9512$

65. (b) $8.16 \times 5.35 + 17.9 - 19.5 \text{ of } \frac{1}{15} + \frac{1}{5}$
$= 43.656 + 17.9 - 1.3 + 0.2$
$= 60.456$

Alternate Method:

$8.16 \times 5.35 + 17.9 - 19.5 \text{ of } \frac{1}{15} + \frac{1}{5}$

Use digital sum method
$\Rightarrow 6 \times 4 + 8 - 1.3 + \frac{2}{10}$
$\Rightarrow 6 + 8 - 4 + 2$
$\Rightarrow 14 - 4 + 2$
$\Rightarrow 10 + 2 = 1 + 2 = 3$ (digital sum)
option 'b' has the only digital sum.

66. (c) $3\frac{1}{7} \div 1\frac{4}{7} + 3 \text{ of } 2\frac{2}{3} + 2.5 \times 2.4 \div 3\frac{1}{3} - 4 \text{ of } 3$
$= \frac{22}{7} \times \frac{7}{11} + 8 + \frac{25 \times 24 \times 3}{100 \times 10} - 12$
$= 10 + \frac{18}{10} - 12$
$= \frac{-2}{10} = \frac{-1}{5}$

67. (d) $(x + y)(x - y)(x^2 + y^2)(x^4 + y^4)(x^8 + y^8)(x^{16} + y^{16})$
We know that,
$(x^2 - y^2) = (x + y)(x - y)$
Now,
$= (x^2 - y^2)(x^2 + y^2)(x^4 + y^4)(x^8 + y^8)(x^{16} + y^{16})$
$= (x^4 - y^4)(x^4 + y^4)(x^8 + y^8)(x^{16} + y^{16})$
$= (x^{16} - y^{16})(x^{16} + y^{16}) = (x^{32} - y^{32})$

68. (d) $11 \times 11 + 11 \div 11 - 11 \times 11 \div 11 + 11 \times 11 - 11 - 11 \times 11$
$= 121 + 1 - 121 + 11 + 121 - 11 - 121 = 1$

69. (b) $b + 2a - [(3b + a) - (2a + b) + 2a] - a$
$= b + 2a - [3b + a - 2a - b + 2a] - a$
$= b + 2a - [2b + a] - a$
$= b + 2a - 2b - a - a = -b$

70. (d) $(x - 2y)(y - 3x) + (x + y)(x - y) + (x - 3y)(2x + y)$
$= 7xy - 3x^2 - 2y^2 + x^2 - y^2 + 2x^2 - 5xy - 3y^2$
$= 2xy - 6y^2 = 2y[x - 3y]$

Alternate Method:

Put $x = 0$
$(x - 2y)(y - 3x) + (x + y)(x - y) + (x - 3y)(2x + y)$
$= (-2y) \times y + (-y^2) + (-3y) \times y$
$= -2y^2 - y^2 - 3y^2 = -6y^2$
Go through options, by option (d)
$2y(x - 3y) = 2y(-3y) = -6y^2$

71. (c) (a) $[2 \times 3 + 5 - \{1 - 2(3 - 2 \times 2)\}]$
$= [6 + 5 - \{1 + 2\}]$
$= 11 - 3 = 8$
* Not satisfied.
(b) $[2 \times 3 - 5 - \{1 + 2(3 - 2 \times 2)\}]$
$= [6 - 5 - \{1 - 2\}]$
$= 6 - 5 + 1 = 2$
* Not satisfied.
(c) $[2 \times 3 - 5 + \{1 + 2(3 - 2 \times 2)\}]$
$= [6 - 5 + \{1 + 2(3 - 4)\}]$
$= [6 - 5 + \{1 - 2\}]$
$= [6 - 5 - 1] = 6 - 6 = 0$
* Satisfied.

72. (c) $(2^2 + 4)^2 \times (3 - 5) + 20\%$ of $400 +$ $x\%$ of $30 = 30\%$ of 30
$\Rightarrow 64 \times (-2) + 80 + \frac{3}{10}x = 9$
$\Rightarrow -48 + \frac{3x}{10} = 9$
$\Rightarrow \frac{3}{10}x = 57 \Rightarrow x = 190$

73. (c) Let, the certain number is x
$x \times \frac{4}{5} \times \frac{5}{6} \times \frac{1}{8} = 4365$
$\Rightarrow x = 4365 \times 12 = 52380$
$\therefore x \times \frac{65}{100} = 52380 \times \frac{65}{100}$
$\Rightarrow x = 34047$

Alternate Method:

The required value $= 4365 \times$
$\times \frac{6}{5} \times 8 \times \frac{65}{100}$
$= 873 \times 3 \times 13$
Unit digit = 7
Hence, option (c) is correct

74. (b) $-7p - [3q - \{8p - (4q - 10p)\}]$
$= -7p - [3q - \{8p - 4q + 10p\}]$
$= -7p - [3q + 4q - 18p] = 11p -$

75. (d) 0.5 + 0.55 + 0.555 + 0.5555
= 5(0.1 + 0.11 + 0.111 + 0.1111)
= 5(0.4321) = 2.1605

76. (b) $x = 0.05 \times 0.36 \div 0.4 + 0.055 + 1.50 \div 0.03$

$= 0.05 \times \frac{0.36}{0.4} + 0.055 + \frac{1.50}{0.03}$

= 0.05 × 0.9 + 0.055 + 50
= 0.045 + 0.055 + 50
= 0.1 + 50 = 50.1

77. (d) $7x + 4\ [x^2 \div (5x \div 10)]\ -3 \left\{5\frac{1}{3} - x^3 + \left(3x^2 \div x\right)\right\} = 0$

$\Rightarrow 7x + 4\left[x^2 \div \frac{1}{2}x\right] - 3\left\{\frac{16}{3} - x^3 + 3x\right\} = 0$

$\Rightarrow 7x + 4 \times 2x - (16 - x^2) = 0$
$\Rightarrow 7x + 8x - 16 + x^2 = 0$
$\Rightarrow x^2 + 15x - 16 = 0$
$\Rightarrow x^2 - x + 16x - 16 = 0$
$\Rightarrow x(x-1) + 16(x-1) = 0$
$\Rightarrow (x-1)(x+16) = 0$
$x = 1,\ x = -16$
∴ Difference = 17

78. (d) $81^{\frac{3}{4}} + \begin{bmatrix}(20 \div 5 \text{ of } 3 \times 6) + \\ \{(8 \div 24 \text{ of } 3) \times 4\} \\ -10 \div 5\end{bmatrix} - \left(\frac{1}{32}\right)^{\frac{-2}{5}}$

$= (3)^{4 \times \frac{3}{4}} + \begin{bmatrix}(20 \div 15 \times 6) + \\ \{(8 \div 72) \times 4\} - 10 \div 5\end{bmatrix} - \left(\frac{1}{2}\right)^{5 \times \frac{-2}{5}}$

$= (3)^3 + \left[\left(\frac{20}{15} \times 6\right) + \left\{\left(\frac{8}{72}\right) \times 4\right\} - 2\right] - 4$

$= 27 + \left[8 + \frac{4}{9} - 2\right] - 4$

$= 27 + 8 - 2 - 4 + \frac{4}{9} = 29\frac{4}{9}$

79. (c) $4^3 - 0^2 + \left(\frac{22}{2}\right)^2 - 8 + 7 \times 6$
= 64 + 121 − 8 + 42
= 227 − 8 = 219

80. (c) $(x - y)(x + y) = x^2 - y^2$
$= (36p^2 + 49q^2)\{(6p)^2 - (7q)^2\}$
$= (36p^2 + 49q^2)(36p^2 - 49q^2)$
$= (36p^2)^2 - (49q^2)^2 = 1296p^4 - 2401q^4$

Alternate Method:
p = 0
q = 1
= 1296 × 0 − 2401 × 1
= −2401

81. (c) Let, required no. is y
ATQ,
$(5 \times 5 \times 5 \times 5 \times 5)^5 \times (5 \times 5 \times 5)^5 \div 5 = (125)^y$
$\Rightarrow (5^5)^5 \times (5^3)^5 \div 5 = (125)^y$
$\Rightarrow 5^{25} \times 5^{15} \div 5 = (5^3)^y$
$\Rightarrow 5^{25} \times 5^{15-1} = 5^{3y} \Rightarrow 5^{25+14} = 5^{3y}$
$\Rightarrow 5^{39} = 5^{3y}$
$\Rightarrow 39 = 3y \Rightarrow y = 13$

82. (d) 25(3 + 4p) ÷ 12 of 5 − 3 × 8 = 6
⇒ 25(3 + 4p) ÷ 60 − 24 = 6

$\Rightarrow \frac{25(3+4p)}{60} = 30$

⇒ 75 + 100p = 1800
⇒ 100p = 1725

$\Rightarrow p = \frac{1725}{100} = 17\frac{1}{4}$

83. (c) (5 + 3 ÷ 5 × 5) ÷ (3 ÷ 3 of 6) of (4 × 4 ÷ 4 of 4 + 4 ÷ 4 × 4)
= (5 + 3 ÷ 5 × 5) ÷ (3 ÷ 18) of (4 × 4 ÷ 16 + 4 ÷ 4 × 4)

$= \left(5 + \frac{3}{5} \times 5\right) \div \left(\frac{3}{18}\right) \text{ of } (1 + 4)$

$= 8 \div \left(\frac{1}{6} \times 5\right) = 9\frac{3}{5}$

84. (d) $\frac{16}{5} \text{ of } \frac{11}{4} \div \frac{11}{3} + \left(\frac{11}{5} \div \frac{7}{5} \text{ of } \frac{10}{7} - \frac{7}{3}\right)$

$= \frac{16}{5} \text{ of } \frac{11}{4} \div \frac{11}{3} + \left(\frac{11}{10} - \frac{7}{3}\right)$

$= \frac{44}{5} \div \frac{11}{3} + \frac{(-37)}{30}$

$= \frac{12}{5} - \frac{37}{30} = \frac{35}{30} = \frac{7}{6} = 1\frac{1}{6}$

85. (c) $5\frac{1}{4} - \left[3\frac{1}{2} - \left\{\frac{5}{6} - \left(\frac{3}{5} \times \frac{1}{10} \div \frac{4}{15}\right)\right\}\right]$

$= \frac{21}{4} - \left[\frac{7}{2} - \left\{\frac{5}{6} - \frac{9}{40}\right\}\right]$

$= \frac{21}{4} - \left[\frac{7}{2} - \frac{73}{120}\right] = \frac{21}{4} - \frac{347}{120}$

$= \frac{283}{120} = 2\frac{43}{120}$

86. (c) $\dfrac{\left(\frac{15}{7} + \frac{43}{7}\right) \div \frac{9}{7}}{\frac{10}{9} \div \left\{\frac{7}{9} + \left(\frac{4}{9} \times \frac{3}{4}\right)\right\}}$

$= \dfrac{\frac{58}{7} \div \frac{9}{7}}{\frac{10}{9} \div \left\{\frac{7}{9} + \frac{3}{9}\right\}} = \dfrac{\frac{58}{9}}{\frac{10}{9} \div \frac{10}{9}} = \frac{58}{9}$

87. (b) $\dfrac{3 + 8 \times 8 \div 8 \text{ of } 8 + 7 \div 7 \times 2}{5 \div 5 \text{ of } 4 + 3 \times 3 \div 3 - 3 + 2}$

$= \dfrac{3 + 1 + 2}{\frac{1}{4} + 3 - 1} = \dfrac{6}{\frac{9}{4}} = \frac{8}{3} = 2\frac{2}{3}$

88. (d) $\left[\frac{85}{34} \times \frac{1}{18} - \left\{\left(\frac{46}{69} \div \frac{27}{135}\right) - \left(\frac{86}{129} \times \frac{91}{14}\right)\right\} \text{ of } \frac{112}{36}\right]$

$= \left[\frac{5}{2} \times \frac{1}{18} - \left\{\frac{2}{3} \times 5 - \frac{2}{3} \times \frac{91}{14}\right\} \times \frac{112}{36}\right]$

$= \left[\frac{5}{36} - \left(\frac{10}{3} - \frac{13}{3}\right) \times \frac{112}{36}\right]$

$= \frac{5}{36} + \frac{112}{36} = \frac{117}{36} = \frac{13}{4} = 3\frac{1}{4}$

89. (a) $5\frac{1}{3} - \left\{4\frac{1}{3} + \left(3\frac{1}{3} + \overline{2\frac{1}{3} - \frac{1}{3}}\right)\right\}$

$= \frac{16}{3} - \left\{\frac{13}{3} + \left(\frac{10}{3} + \overline{\frac{7}{3} - \frac{1}{3}}\right)\right\}$

$= \frac{16}{3} - \left\{\frac{13}{3} + \left(\frac{10}{3} + 2\right)\right\}$

$= \frac{16}{3} - \left\{\frac{13}{3} + \frac{5}{3}\right\} = \frac{16}{3} - \frac{18}{3} = \frac{-2}{3}$

90. (a) $\left(\dfrac{88 \div 8 \times k - 3 \times 3}{6^2 - 7 \times 5 + k^2}\right) = 1$

$\Rightarrow \dfrac{11k - 9}{36 - 35 + k^2} = 1$

$\Rightarrow 11k - 9 = 1 + k^2$
$\Rightarrow k^2 - 11k + 10 = 0$
$\Rightarrow k = 1, 10$

Alternate Method:
Also satisfy for option

91. (b) $1020 \div \left[\frac{4}{3} \text{ of } (26 + 4) - 11\frac{2}{3}\right]$

$= 1020 \div \left[\frac{4}{3} \text{ of } 30 - \frac{35}{3}\right]$

$= 1020 \div \left[40 - \frac{35}{3}\right]$

$= 1020 \times \frac{3}{85} = 36$

92. (b) $4\frac{4}{5} \times \frac{3}{8} + \left(3\frac{1}{2} + \frac{2}{3}\right) \times \frac{4}{5}$

$= \frac{24}{5} \times \frac{3}{8} + \left(\frac{7}{2} + \frac{2}{3}\right) \times \frac{4}{5}$

$= \frac{9}{5} + \frac{25}{6} \times \frac{4}{5} = \frac{9}{5} + \frac{20}{6}$

$= \frac{54 + 100}{30} = \frac{154}{30} = \frac{77}{15}$

93. (d)

$\left[(2.5 + 1.5)^2 \div 4 \text{ of } \frac{1}{2} \times 8 - 1\right]$

$= [4^2 \div 2 \times 8 - 1]$
= 16 ÷ 2 × 8 − 1 = 64 − 1 = 63

94. (b) $1\frac{1}{3} + 1\frac{3}{4} \times 1\frac{2}{3} \div 3\frac{1}{2}$

$= \frac{4}{3} + \frac{7}{4} \times \frac{5}{3} \times \frac{2}{7}$

$= \frac{4}{3} + \frac{5}{6} = \frac{8 + 5}{6} = \frac{13}{6} = 2\frac{1}{6}$

95. (b)

$\left[\left(\frac{1}{6} \div \frac{1}{9} \times \frac{2}{3}\right) \times 18 + 5\right]$

$= \left[\left(\frac{1}{6} \times 9 \times \frac{2}{3}\right) \times 18 + 5\right] = 18 + 5 = 23$

96. (a) $\left(5 - \frac{15}{16}\right) \times 1\frac{12}{13}$

$= \frac{65}{16} \times \frac{25}{13} = \frac{125}{16} = 7\frac{13}{16}$

97. (a) $\frac{-7}{6} + \frac{4}{9} \div \frac{5}{3} \times \frac{1}{16}$

$= \frac{-7}{6} + \frac{1}{60} = \frac{-70 + 1}{60} = \frac{-69}{60} = \frac{-23}{20}$

98. (a)

$\left[\left(5\frac{1}{2} - 3\frac{1}{3}\right) \text{of } 1\frac{5}{13} + 1 - 2 \times 3\frac{5}{2} \div 2\frac{3}{4}\right]$

$= \left[\left(\frac{11}{2} - \frac{10}{3}\right) \text{of } \frac{18}{13} + 1 - 2 \times \frac{11}{2} \times \frac{4}{11}\right]$

$= \frac{13}{6} \text{ of } \frac{18}{13} + 1 - 4$

= 3 + 1 − 4 = 0

99. (d) $4\frac{1}{6} \div 25 \times 75 \div \frac{1}{5}$ of 125

$$= \frac{25}{6} \times \frac{1}{25} \times 75 \div 25$$

$$= \frac{25}{6} \times \frac{1}{25} \times 75 \times \frac{1}{25} = \frac{1}{2}$$

100. (d) $9 \div \left[1 + \left\{4 \times \left(\frac{5}{6} - \overline{\frac{1}{3} + \frac{1}{2}}\right)\right\}\right]$

$$= 9 \div \left[1 + \left\{4 \times \left(\frac{5}{6} - \frac{5}{6}\right)\right\}\right]$$

$$= 9 \div [1 + \{0\}] = 9$$

101. (a) $\frac{4}{7} \times 4\frac{1}{2} \div 5\frac{1}{3}$ of $2\frac{1}{2} -$

$$\left(7\frac{7}{8} \div 5\frac{1}{9} \text{ of } 9\frac{9}{20}\right) + \frac{1}{2}$$

$$= \frac{4}{7} \times \frac{9}{2} \div \frac{16}{3} \text{ of } \frac{5}{2} -$$

$$\left(\frac{63}{8} \div \frac{46}{9} \text{ of } \frac{189}{20}\right) + \frac{1}{2}$$

$$= \frac{4}{7} \times \frac{9}{2} \div \frac{40}{3} - \left(\frac{63}{8} \div \frac{483}{10}\right) + \frac{1}{2}$$

$$= \frac{4}{7} \times \frac{27}{80} - \frac{15}{92} + \frac{1}{2}$$

$$= \frac{27}{140} - \frac{15}{92} + \frac{1}{2}$$

$$= \frac{621 - 525 + 1610}{3220} = \frac{1706}{3220} = \frac{853}{1610}$$

102. (c) $\frac{(7 + 8 \times 7 \div 8 + 7 \div 7 \div 7)}{(3 + 3 \times 3 \div 3 + 5 \div 5 \div 5)}$

$$= \left(\frac{7 + 7 + \frac{1}{7}}{3 + 3 + \frac{1}{5}}\right) = \left(\frac{\frac{49 + 49 + 1}{7}}{\frac{15 + 15 + 1}{5}}\right)$$

$$= \left(\frac{99 \times 5}{31 \times 7}\right) = \frac{495}{217} = 2\frac{61}{217}$$

103. (c)

$$A = 60\left[\frac{6}{25} \div \left(\frac{16}{15} \text{ of } \frac{3}{8}\right) + 5 - \left(1 - 2\frac{1}{12}\right)\right]$$

$$= 60\left[\frac{6}{25} \div \left(\frac{2}{5}\right) + 5 - \left(1 - \frac{25}{12}\right)\right]$$

$$= 60\left[\frac{3}{5} + 5 + \frac{13}{12}\right]$$

$$= 60\left[\frac{36 + 300 + 65}{60}\right] = 401$$

Sum of digit = 4 + 0 + 1 = 5

104. (a)

$$\frac{15}{8} + \left[\left\{\frac{4}{5} \text{ of } \frac{5}{12} \div \left(1\frac{1}{15}\right)\right\} \times 1\frac{7}{12}\right]$$

$$= \frac{15}{8} + \left[\left\{\frac{1}{3} \div \left(\frac{16}{15}\right)\right\} \times \frac{19}{12}\right]$$

$$= \frac{15}{8} + \frac{95}{192} = \frac{360 + 95}{192} = \frac{455}{192}$$

$$= \frac{a}{b}$$

$$\therefore 4b - a = 4 \times 192 - 455$$

$$= 768 - 455 = 313$$

Note: (4b − a) can be calculated with the help of unit digit.

105. (b) $\left(24 \div 3 \text{ of } \frac{1}{6}\right) \times \left(\frac{4}{5} \div \frac{9}{8} \times \frac{3}{5}\right) \div$

$$\left(\frac{4}{7} \div \frac{3}{14} \text{ of } \frac{3}{14}\right)$$

$$= 48 \times \frac{32}{75} \div \left(\frac{4}{7} \div \frac{9}{196}\right)$$

$$= 48 \times \frac{32}{75} \div \frac{112}{9}$$

$$= 48 \times \frac{32}{75} \times \frac{9}{112} = \frac{288}{175}$$

106. (c) $\frac{\frac{1}{2} \div \frac{3}{4} \text{ of } \frac{5}{6}}{\frac{1}{2} \div \frac{3}{4} \times \frac{5}{6}} + \frac{2 + 2 \times 2}{2 \div 2 \times 2}$

$$= \frac{\frac{1}{2} \div \frac{5}{8}}{\frac{2}{3} \times \frac{5}{6}} + \frac{6}{2} = \frac{\frac{4}{5}}{\frac{5}{9}} + 3$$

$$= \frac{36}{25} + 3 = \frac{111}{25}$$

107. (d) $A = \frac{9}{16} \div \frac{25}{36} = \frac{9}{16} \times \frac{36}{25} = \frac{81}{100}$

$$B = 9 \div [(16 \div 25) \div 36]$$

$$= 9 \div \left[\frac{16}{25 \times 36}\right] = \frac{9 \times 25 \times 36}{16}$$

$$= 506.25$$

$$C = [9 \div (16 \div 25)] \div 36$$

$$= \left[9 \div \frac{16}{25}\right] \div 36$$

$$= \left[\frac{9 \times 25}{16}\right] \div 36 = \frac{9 \times 25}{16 \times 36} = \frac{25}{64}$$

$$D = (9 \div 16) \div (25 \div 36)$$

$$= \frac{9}{16} \times \frac{36}{25} = \frac{81}{100}$$

A and D are equal.

SMART APPROACH:-
A and D are equal which can be seen directly without simplify.

108. (b) $1\frac{1}{3} \div \left[2\frac{1}{6} \div \left\{14\frac{1}{3} - \left(2\frac{1}{3} + 3\frac{1}{2}\right)\right\}\right]$

$$= \frac{4}{3} \div \left[\frac{13}{6} \div \left\{\frac{43}{3} - \left(\frac{7}{3} + \frac{7}{2}\right)\right\}\right]$$

$$= \frac{4}{3} \div \left[\frac{13}{6} \div \left\{\frac{43}{3} - \frac{35}{6}\right\}\right]$$

$$= \frac{4}{3} \div \left[\frac{13}{6} \div \left\{\frac{51}{6}\right\}\right] = \frac{4}{3} \div \frac{13}{51} = \frac{68}{13}$$

$$= 5\frac{3}{13}$$

109. (d) $\frac{5 + 7 \times 5 \div 8 \text{ of } 5 + 3 \div 3 \times 5}{6 \div 6 \text{ of } 4 + 9 \times 9 \div 3 \times 2 \times 2}$

$$= \frac{5 + \frac{7}{8} + 5}{\frac{1}{4} + 108} = \frac{\frac{87}{8}}{\frac{433}{4}}$$

$$= \frac{87}{8} \times \frac{4}{433} = \frac{87}{866}$$

110. (d) $2\frac{1}{4} \times 3\frac{1}{5} + 5\frac{1}{6}$ of $2\frac{4}{31} \div 3\frac{2}{3}$

$$+ 4\frac{1}{7} \text{ of } 1\frac{6}{29}$$

$$= \frac{9}{4} \times \frac{16}{5} + \frac{31}{6} \text{ of } \frac{66}{31} \div \frac{11}{3} + \frac{29}{7} \text{ of } \frac{35}{29}$$

$$= \frac{36}{5} + 3 + 5 = \frac{76}{5} = 15\frac{1}{5}$$

111. (c)

$$420 \div \left[\frac{4}{9} \times \left(1 + \frac{4}{5}\right) \times 5\right] + \left[\frac{5}{7} \text{ of } \frac{21}{25} \div \frac{3}{4} \text{ of } \frac{2}{5}\right]$$

$$= 420 \div \left[\frac{4}{9} \times \left(\frac{9}{5}\right) \times 5\right] + \left[\frac{3}{5} \div \frac{3}{10}\right]$$

$$= 420 \div [4] + [2]$$

$$= 105 + 2 = 107$$

112. (a) $469 \div \left[270 \div \left(\frac{3}{7} \times 35\right) + (19 \times 3) - \left(\frac{21}{2} - \frac{5}{2}\right.\right.$

= 469 ÷ [270 ÷ 15 + 57 − 8] = 469 ÷ [18 + 57 − 8] = 469 ÷ 67 = 7

113. (b) $\frac{2 \times 2 + 2}{2 \div 2 \times 2} \div \frac{\frac{1}{2} \div \frac{1}{2} \text{ of } \frac{1}{2}}{\frac{1}{2} + \frac{1}{2} \text{ of } \frac{1}{2}}$

$$= \frac{6}{2} \div \frac{\frac{1}{2} \div \frac{1}{4}}{\frac{1}{2} + \frac{1}{4}}$$

$$= 3 \div \frac{2 \times 4}{3} = \frac{3 \times 3}{8} = \frac{9}{8} = 1\frac{1}{8}$$

114. (d)

$$\left[7 + 9 - 2\left\{\left(3 \div \frac{1}{3}\right) - 3\right\} + 27 \div 3 + (27 \div 9 + 3) - 6\right] + 2$$

$$= [7 + 9 - 2\{6\} + 9 + 6 - 6] + 2$$

$$= [16 - 12 + 9] + 2 = 15$$

115. (a) $3\frac{4}{7} - \left[16\frac{1}{2} \div \left\{6^2 - \left(7 - 2\frac{1}{2}\right)\right\}\right]$

$$= \frac{25}{7} - \left[\frac{33}{2} \div \{36 - 4.5\}\right]$$

$$= \frac{25}{7} - \left[\frac{33}{2} \times \frac{1}{31.5}\right] = \frac{25}{7} - \frac{33}{63}$$

$$= \frac{225 - 33}{63} = \frac{192}{63} = \frac{64}{21}$$

116. (a) $10 + 3\frac{3}{5} \div \left[2\frac{2}{3} \div \left\{7\frac{1}{6} - \left(2\frac{1}{2} + \frac{2}{3}\right)\right\}\right]$

$$= 10 + \frac{18}{5} \div \left[\frac{8}{3} \div \left\{\frac{43}{6} - \left(\frac{5}{2} + \frac{2}{3}\right)\right\}\right]$$

$$= 10 + \frac{18}{5} \div \left[\frac{8}{3} \div \left\{\left(\frac{43}{6} - \frac{19}{6}\right)\right\}\right]$$

$= 10 + \frac{18}{5} \div \left[\frac{8}{3} \div \frac{24}{6}\right] = 10 + \frac{18}{5} \times \frac{3}{2}$

$= 10 + \frac{27}{5} = \frac{77}{5}$

117. (b) $\left\{(3^3 + 2^3) \times \frac{22}{7}\right\} \times \left\{(6^2 + 3^2 - 4^2) \div \left(14\frac{1}{2}\right)\right\}$

$= \left\{35 \times \frac{22}{7}\right\} \times \left\{29 \times \frac{2}{29}\right\}$

$= 110 \times 2 = 220$

118. (b) $\left[3 \times 6 - 3\left\{2\left(2 \div \frac{1}{2} - 2\right) + 2 \div \frac{1}{2}\right\} - 18\right]$

$= [18 - 3\{2(2) + 4\} - 18]$

$= [18 - 3 \times 8 - 18] = -24$

119. (b) $\left[6 - 2\left\{3 - 4\left(4 \div \frac{1}{4} - 1\right) + 2 \div \frac{1}{3}\right\} - 3 \times 2\right]$

$= [6 - 2\{3 - 4 \times 15 + 6\} - 6]$

$= [6 - 2\{3 - 60 + 6\} - 6]$

$= [6 - 2 \times (-51) - 6] = 102$

120. (b) $4\frac{1}{4} \times 4\frac{1}{4} - 2 \times 4\frac{1}{4} \times \frac{1}{4} + \frac{1}{4} \times \frac{1}{4}$

$= \frac{17}{4} \times \frac{17}{4} - 2 \times \frac{17}{4} \times \frac{1}{4} + \frac{1}{16}$

$= \frac{289}{16} - \frac{34}{16} + \frac{1}{16}$

$= \frac{256}{16} = 16$

Alternate Method:

Use the formula $(x - y)^2$

$x = 4\frac{1}{4}, y = \frac{1}{4}$

$\left(\frac{17}{4} - \frac{1}{4}\right)^2 = 16$

121. (b) $\frac{\left[\frac{1}{4} \div \frac{1}{4} \times \frac{1}{4}\right] \times \frac{1}{4}}{\left[\frac{1}{8} + \frac{1}{8} \times \frac{1}{8}\right]} + \left(1 - \frac{4}{9}\right)$

$= \frac{\left[\frac{1}{4} \times 4 \times \frac{1}{4}\right] \times \frac{1}{4}}{\left[\frac{1}{8} + \frac{1}{64}\right]} + \left(\frac{5}{9}\right)$

$= \frac{\frac{1}{16}}{\frac{9}{64}} + \frac{5}{9} = \frac{1}{16} \times \frac{64}{9} + \frac{5}{9}$

$= \frac{4+5}{9} = \frac{9}{9} = 1$

122. (b) $\frac{3}{2} \times \frac{11}{5} \div \left(\frac{25}{44} \times \frac{11}{5}\right) \div \frac{33}{15}$

$= \frac{3}{2} \times \frac{11}{5} \div \frac{5}{4} \div \frac{11}{5}$

$= \frac{3}{2} \times \frac{11}{5} \times \frac{4}{5} \times \frac{5}{11} = \frac{6}{5}$

123. (d) $11\frac{1}{4} \div 3\frac{3}{5} \times 6\frac{2}{3} + \frac{1}{6}$

$= \frac{45}{4} \times \frac{5}{18} \times \frac{20}{3} + \frac{1}{6}$

$= \frac{125}{6} + \frac{1}{6} = \frac{126}{6} = 21$

124. (b) $[18 - 3 \times \{3 - 3\,(3 \div \frac{1}{3} - 3) + 3 \div \frac{1}{3} + 3\} - 4 \times 2]$

$= [18 - 3 \times \{3 - 3\,(6) + 12\} - 8]$

$= [18 - 3 \times (-3) - 8]$

$= 18 + 9 - 8 = 19$

125. (a) $\frac{143 \div 13 \times x - 3 \times 3}{6^2 - 7 \times 5 + x^2} = 1$

$\Rightarrow 11x - 9 = 1 + x^2$

$\Rightarrow x^2 - 11x + 10 = 0$

$\Rightarrow x^2 - 10x - x + 10 = 0$

$\Rightarrow x(x - 10) - 1\,(x - 10) = 0$

$\Rightarrow (x - 1)\,(x - 10) = 0$

$\Rightarrow x = 1$ and 10

126. (b) $\frac{12 + 3\frac{2}{3} \div \left[\frac{7}{4} \div \left\{\frac{21}{4} \times \left(\frac{18}{5} \times \frac{2}{9}\right)\right\}\right]}{\frac{4}{3} \times \frac{26}{5}}$

$= \frac{12 + \frac{11}{3} \div \left[\frac{7}{4} \div \left\{\frac{21}{5}\right\}\right]}{\frac{104}{15}}$

$= \frac{12 + \frac{11}{3} \div \frac{5}{12}}{\frac{104}{15}}$

$= \frac{12 + \frac{44}{5}}{\frac{104}{15}} = \frac{104}{5} \times \frac{15}{104} = 3$

127. (a) $\left[3\frac{2}{5} \times \left\{2\frac{3}{4} + 3.3\left(5\frac{1}{3} + 3\frac{1}{3} - 2\frac{1}{3}\right)\right\}\right]$

$= \left[\frac{17}{5} \times \left\{\frac{11}{4} + 3.3\left(\frac{16}{3} + \frac{10}{3} - \frac{7}{3}\right)\right\}\right]$

$= \frac{17}{5} \times \left\{\frac{11}{4} + 3.3\left[\frac{19}{3}\right]\right\}$

$= \frac{17}{5} \times \left\{\frac{11}{4} + 20.9\right\}$

$= \frac{17}{5} \times 23.65 = 80.41$

Note: check multiple of 17 in given option.

128. (c) $\left[\begin{matrix} 9 + 3 - 2 \times \left\{\left(4 \div \frac{1}{4}\right) - 4\right\} \\ + 81 \div 9 + 81 \div 9 + 3 - 9 \end{matrix}\right] + 9$

$= [12 - 2 \times \{12\} + 9 + 9 - 6] + 9$

$= 12 - 24 + 18 - 6 + 9 = 9$

129. (b) $\frac{2\left\{3 + 3\left(\frac{1}{4} \div \frac{15}{20} + 2\right) - 18 \times \frac{1}{3}\right\}}{2(4 + 20 \div 4)}$

$= \frac{2\left\{3 + 3\left(\frac{1}{3} + 2\right) - 6\right\}}{2(4 + 5)}$

$= \frac{2\{3 + 7 - 6\}}{18} = \frac{8}{18} = \frac{4}{9}$

130. (c) $\frac{13 \div \{6 - 6 \div (-2) \times 8 + 9\}}{6}$

$= \frac{13 \div \{6 + 3 \times 8 + 9\}}{6}$

$= \frac{13 \div (39)}{6} = \frac{1}{3} \times \frac{1}{6} = \frac{1}{18}$

131. (b) $\left(\frac{5}{2} + \frac{7}{4} - \frac{1}{6}\right) \times \frac{16}{49}$

$= \left(\frac{30 + 21 - 2}{12}\right) \times \frac{16}{49}$

$= \frac{49}{12} \times \frac{16}{49} = \frac{4}{3} = 1\frac{1}{3}$

132. (c) $\left[\left(\frac{29}{4}\right)^2 - \left(\frac{29}{5}\right)^2\right] \div \frac{29}{5} \times \frac{16}{9}$

$= \left[\frac{841}{16} - \frac{841}{25}\right] \div \frac{29}{5} \times \frac{16}{9}$

$= \frac{841 \times 9}{16 \times 25} \times \frac{5}{29} \times \frac{16}{9} = 5.8$

133. (a) $\frac{7 + 8 \times 8 \div 8 \text{ of } 8 + 8 \div 8 \times 5}{4 \div 4 \text{ of } 4 + 4 \times 4 \div 4 - 4 \div 4}$

$= \frac{7 + 8 \times \frac{1}{8} + 5}{\frac{1}{4} + 4 - 1}$

$= \frac{7 + 1 + 5}{\frac{1}{4} + 3} = \frac{13 \times 4}{13} = 4$

134. (a) $\frac{1}{2^2} + \frac{1}{2^3} \div \left(\frac{1}{2} + \frac{1}{2} \div 1\right)$

$+ 3\frac{1}{3} \div \frac{5}{2} \times \frac{3}{4} \div 6\frac{2}{3} \times \frac{7}{6}$

$= \frac{1}{4} + \frac{1}{8} \times 1 + \frac{10}{3} \times \frac{2}{5} \times \frac{3}{4} \times \frac{3}{20} \times \frac{7}{6}$

$= \frac{1}{4} + \frac{1}{8} + \frac{7}{40} = \frac{10 + 5 + 7}{40} = \frac{22}{40} = \frac{11}{20}$

135. (c) $\frac{166}{3} \div \left[\frac{16}{5} + \left\{\frac{5}{2} - \frac{44}{15}\right\}\right]$

$= \frac{166}{3} \div \left[\frac{16}{5} - \frac{13}{30}\right]$

$= \frac{166}{3} \div \frac{83}{30} = 20$

136. (c) $\frac{61 + \frac{2}{5} \times \frac{75}{6} - (3 \times 6 \times 3) \times \frac{1}{6}}{19}$

$= \frac{66 - 9}{19} = \frac{57}{19} = 3$

137. (a) $\frac{(x^2 - 9)(9x^2 - 1)}{\left(x - \frac{1}{3}\right)\left(1 - \frac{x}{3}\right)} \times \frac{9}{\left(x + \frac{1}{3}\right)\left(1 + \frac{x}{3}\right)}$

$= \frac{(x^2 - 9)(9x^2 - 1) \times 9}{\left(x^2 - \frac{1}{9}\right)\left(1 - \frac{x^2}{9}\right)}$

$= \frac{(x^2 - 9)(9x^2 - 1) \times 9}{\frac{(9x^2 - 1)(9 - x^2)}{9 \times 9}}$

$= -9 \times 9 \times 9 = -729$

Alternate Method:

Put $x = 0$

$$\frac{(x^2-9)(9x^2-1)}{\left(x-\frac{1}{3}\right)\left(1-\frac{x}{3}\right)} \times \frac{9}{\left(x+\frac{1}{3}\right)\left(1+\frac{x}{3}\right)}$$

$$= \frac{(-9)(-1)}{\left(-\frac{1}{3}\right)(1)} \times \frac{9}{\left(\frac{1}{3}\right)\times 1}$$

$$= -9 \times 3 \times 9 \times 3 = -729$$

138. (c) $\left[\frac{1}{8}+\left\{\frac{1}{6}\times\left(\frac{36}{45}\div\frac{24}{25}\right)-\left(\frac{12}{21}\times\frac{14}{15}\div\frac{24}{45}\right)\right\}+\frac{27}{36}\right]$

$$= \left[\frac{1}{8}+\left\{\frac{1}{6}\times\frac{36}{45}\times\frac{25}{24}-\frac{12}{21}\times\frac{14}{15}\times\frac{45}{24}\right\}+\frac{27}{36}\right]$$

$$= \left[\frac{1}{8}+\left\{\frac{5}{36}-1\right\}+\frac{27}{36}\right] = \left[\frac{1}{8}+\frac{5}{36}+\frac{27}{36}-1\right]$$

$$= \left[\frac{1}{8}+\frac{8}{9}-1\right] = \frac{1}{72}$$

139. (d) $\frac{a^2-b^2-2bc-c^2}{a^2+b^2+2ab-c^2}$

$$= \frac{a^2-(b+c)^2}{(a+b)^2-c^2}$$

$$= \frac{[a-(b+c)][a+b+c]}{[(a+b-c)][a+b+c]}$$

$$= \frac{a-b-c}{a+b-c}$$

140. (a) $1\frac{2}{5}-\left[3\frac{3}{4}\div\left\{1\frac{1}{4}\div\frac{1}{2}\left(1\frac{1}{2}\times 3\frac{1}{3}\div 1\frac{1}{3}\right)\right\}\right]$

$$= \frac{7}{5}-\left[\frac{15}{4}\div\left\{\frac{5}{4}\div\frac{1}{2}\left(\frac{3}{2}\times\frac{10}{3}\div\frac{4}{3}\right)\right\}\right]$$

$$= \frac{7}{5}-\left[\frac{15}{4}\div\left\{\frac{5}{4}\div\frac{1}{2}\left(\frac{3}{2}\times\frac{10}{3}\times\frac{3}{4}\right)\right\}\right]$$

$$= \frac{7}{5}-\left[\frac{15}{4}\div\left\{\frac{5}{4}\div\frac{1}{2}\times\frac{15}{4}\right\}\right]$$

$$= \frac{7}{5}-\left[\frac{15}{4}\div\left\{\frac{5}{2}\times\frac{15}{4}\right\}\right]$$

$$= \frac{7}{5}-\left[\frac{15}{4}\div\frac{75}{8}\right] = \frac{7}{5}-\frac{2}{5} = \frac{5}{5} = 1$$

141. (a) $3\frac{1}{2}-\left[2\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{3}{4}\left(1\frac{1}{2}-\frac{1}{2}-2\frac{1}{2}\right)\right\}\right] = ?$

$$= \frac{7}{2}-\left[\frac{9}{4}\div\left\{\frac{5}{4}-\frac{3}{4}\left(\frac{3}{2}-\frac{1}{2}-\frac{5}{2}\right)\right\}\right]$$

$$= \frac{7}{2}-\left[\frac{9}{4}\div\left\{\frac{5}{4}-\frac{3}{4}\left(-\frac{3}{2}\right)\right\}\right]$$

$$= \frac{7}{2}-\left[\frac{9}{4}\div\left\{\frac{10+9}{8}\right\}\right]$$

$$= \frac{7}{2}-\left[\frac{9}{4}\times\frac{8}{19}\right] = \frac{7}{2}-\frac{18}{19}$$

$$= \frac{133-36}{38} = \frac{97}{38} = 2\frac{21}{38}$$

142. (a) $\frac{\left[\frac{1}{5}\div\frac{1}{5}\times\frac{1}{5}\right]\times\frac{1}{5}}{\left[\frac{1}{9}+\frac{1}{9}\times\frac{1}{9}\right]\times\frac{1}{10}}+\left(1-\frac{6}{25}\right)$

$$= \frac{\left[\frac{1}{5}\times\frac{5}{1}\times\frac{1}{5}\right]\times\frac{1}{5}}{\left[\frac{1}{9}+\frac{1}{81}\right]\times\frac{1}{10}}+\frac{19}{25}$$

$$= \frac{\left(\frac{1}{25}\right)}{\frac{10}{81}\times\frac{1}{10}}+\frac{19}{25} = \frac{81}{25}+\frac{19}{25} = 4$$

143. (a) $\frac{4^{a+4}-5\times 4^{a+2}}{15\times 4^a-2^2\times 4^a}$

Put, a = 0

$$\frac{4^4-5\times 16}{11} = \frac{176}{11} = 16$$

144. (a) Put $x = y = z = 1$, $p = \frac{1}{1+1} = \frac{1}{2}$,

$$q = \frac{1}{1+1} = \frac{1}{2},\ r = \frac{1}{1+1} = \frac{1}{2}$$

$$\therefore \frac{1}{2+2p}+\frac{1}{2+2q}+\frac{1}{2+2r}$$

$$= \frac{1}{2+1}+\frac{1}{2+1}+\frac{1}{2+1} = \frac{3}{3} = 1$$

145. (d) $\frac{x^2-2x-63}{x^2+14x+49} = \frac{x^2-(9x-7x)-63}{(x+7)^2}$

$$= \frac{(x-9)(x+7)}{(x+7)^2} = \frac{x-9}{x+7}$$

146. (a) $\frac{\frac{49}{63}\div\frac{21}{9}-\frac{85}{510}+\frac{88}{132}\div\frac{66}{11}}{\frac{1}{7}\div\frac{33}{21}+\frac{26}{143}-\frac{1}{209}\div\frac{1}{19}}$

$$= \frac{\frac{49}{63}\times\frac{9}{21}-\frac{85}{510}+\frac{88}{132}\times\frac{11}{66}}{\frac{1}{7}\times\frac{21}{33}+\frac{26}{143}-\frac{1}{209}\times 19}$$

$$= \frac{\frac{1}{3}-\frac{1}{6}+\frac{1}{9}}{\frac{1}{11}+\frac{2}{11}-\frac{1}{11}} = \frac{6-3+2}{18}\times\frac{11}{2} = \frac{55}{36}$$

147. (d) $\frac{\frac{5}{2}\div\frac{2}{5}\times\frac{1}{5}-\frac{1}{5}\div\frac{3}{5}\times\frac{5}{2}}{\frac{2}{5}\div\frac{1}{5}-\frac{1}{2}\times\frac{5}{2}\div\frac{25}{4}+\frac{1}{2}\div\frac{2}{5}\times\frac{1}{5}}$

$$= \frac{\frac{5}{2}\times\frac{5}{2}\times\frac{1}{5}-\frac{1}{5}\times\frac{5}{3}\times\frac{5}{2}}{\frac{2}{5}\times\frac{5}{1}-\frac{1}{2}\times\frac{5}{2}\times\frac{4}{25}+\frac{1}{2}\times\frac{5}{2}\times\frac{1}{5}}$$

$$= \frac{\frac{5}{4}-\frac{5}{6}}{2-\frac{1}{5}+\frac{1}{4}} = \frac{\frac{5}{12}}{\frac{9}{4}-\frac{1}{5}} = \frac{\frac{5}{12}}{\frac{41}{20}}$$

$$= \frac{5}{12}\times\frac{20}{41} = \frac{25}{123}$$

148. (d) 25% of 720 + 57 ÷ $19\times\frac{1}{3}$ of $\frac{100}{11}$ of $\frac{33}{25}$ − 15% of 300

$$= \frac{25}{100}\times 720+\frac{57}{19}\times\frac{1}{3}\times\frac{100}{11}\times\frac{33}{25}-\frac{15}{100}\times 300$$

$$= 180+12-45 = 192-45 = 147$$

149. (c) $\frac{7\times 4\div 8}{5\times 25\div 125}+\frac{5\times 4\div 8}{8\times 4\div 16}-\frac{7\times 4\div 2}{8\times 7\div 4}$

$$= \frac{\frac{7}{2}}{1}+\frac{\frac{5}{2}}{2}-\frac{14}{14} = \frac{7}{2}+\frac{5}{4}-1$$

$$= \frac{19}{4}-1 = \frac{15}{4}$$

150. (a) $\frac{\frac{5}{6}\text{ of }\frac{1}{3}\times\frac{12}{25}-\frac{1}{3}\text{ of }\frac{5}{6}\times\frac{18}{25}}{\frac{25}{12}\text{ of }\frac{1}{6}\times\frac{2}{5}+\frac{3}{8}\text{ of }\frac{12}{25}\times\frac{5}{6}}$

$$= \frac{\frac{5}{18}\times\frac{12}{25}-\frac{5}{18}\times\frac{18}{25}}{\frac{25}{72}\times\frac{2}{5}+\frac{36}{200}\times\frac{5}{6}} = \frac{\frac{-1}{15}}{\frac{208}{720}}$$

$$= \frac{-1}{15}\times\frac{720}{208} = \frac{-3}{13}$$

151. (b) $\frac{\frac{3}{4}\div\frac{9}{64}+\frac{7}{11}\times\frac{121}{14}-\frac{9}{13}\times\frac{65}{36}}{\frac{1}{2}\div\frac{4}{5}+\frac{3}{4}\times\frac{16}{15}}$

$$= \frac{\frac{3}{4}\times\frac{64}{9}+\frac{7}{11}\times\frac{121}{14}-\frac{9}{13}\times\frac{65}{36}}{\frac{1}{2}\times\frac{5}{4}+\frac{3}{4}\times\frac{16}{15}}$$

$$= \frac{\frac{16}{3}+\frac{11}{2}-\frac{5}{4}}{\frac{5}{8}+\frac{4}{5}} = \frac{\frac{64+66-15}{12}}{\frac{25+32}{40}}$$

$$= \frac{130-15}{12}\times\frac{40}{57} = \frac{115\times 40}{12\times 57} = \frac{1150}{171}$$

152. (a) $456-(76+15^2)+\frac{3}{4}\text{ of }\frac{76}{18}\div\left(\frac{19}{72\times 24}\right)$

$$= 456-(76+225)+\frac{19}{6}\div\left(\frac{19}{72\times 24}\right)$$

$$= 456-301+\frac{19}{6}\times\left(\frac{72\times 24}{19}\right)$$

$$= 456-301+288 = 744-301 = 44$$

153. (c) $\frac{\left[\frac{5}{8}-\left\{\frac{3}{8}-\left(\frac{5}{8}-\frac{3}{8}\right)\right\}\right]\text{ of }8.8-1.2}{4\frac{1}{6}\div 2.5\times 2\div\frac{1}{6}\text{ of }60+\left(\frac{3}{4}-\frac{3}{8}\right)}$

$$= \frac{\left[\frac{5}{8}-\left\{\frac{3}{8}-\frac{2}{8}\right\}\right]\text{ of }8.8-1.2}{\frac{25}{6}\div 2.5\times 2\div 10+\left(\frac{6-3}{8}\right)}$$

$$= \frac{\left[\frac{5}{8}-\frac{1}{8}\right]\text{ of }8.8-1.2}{\frac{25}{6}\times\frac{10}{25}\times 2\times\frac{1}{10}+\left(\frac{3}{8}\right)}$$

$$= \frac{\frac{1}{2}\text{ of }8.8-1.2}{\frac{1}{3}+\left(\frac{3}{8}\right)} = \frac{4.4-1.2}{\frac{1}{3}+\left(\frac{3}{8}\right)}$$

$$= \frac{4.4-1.2}{\frac{8+9}{24}} = \frac{3.2\times 24}{17} = 4\frac{44}{85}$$

154. (b) $\dfrac{(187 \div 17 \times a - 3 \times 3)}{(8^2 - 9 \times 7 + a^2)} = 1$

$\Rightarrow \dfrac{11a - 9}{1 + a^2} = 1$

$\Rightarrow 11a - 9 = 1 + a^2$
$\Rightarrow a^2 - 11a + 10 = 0$
$\Rightarrow a^2 - 10a - a + 10 = 0$
$\Rightarrow a(a - 10) - 1(a - 10) = 0$
$\Rightarrow (a - 1)(a - 10) = 0$
$\Rightarrow a = 1$ or 10

Hence, Answer (b)

Alternate Method:

Put $a = 1$

$\dfrac{187 \div 17 \times 1 - 3 \times 3}{8^2 - 9 \times 7 + 1^2}$

$= \dfrac{11 - 9}{64 - 63 + 1} = \dfrac{2}{2} = 1$ (Satisfied)

155. (d) $\left[25^2 + 8 \div 2^3 - \left\{\begin{matrix}16 + \left(28 \text{ of } 7 \div 2^2\right)\\ -\left(18^2 \div 12^2 \text{ of } \frac{1}{8}\right)\end{matrix}\right\}\right]$

$= \left[625 + 8 \div 8 - \left\{\begin{matrix}16 + (28 \text{ of } 7 \div 4) -\\ \left(324 \div 144 \text{ of } \frac{1}{8}\right)\end{matrix}\right\}\right]$

$= [625 + 1 - \{16 + 49 - (324 \div 18)\}]$
$= [626 - \{16 + 49 - 18\}]$
$= 626 - 47 = 579$

156. (b) $\dfrac{2x + 3}{18 \div 3 \times 4 + 2} = \dfrac{12 \times 3 + 5}{2 \times 4 \div 2}$

$\Rightarrow \dfrac{2x + 3}{6 \times 4 + 2} = \dfrac{36 + 5}{2 \times 2} \Rightarrow \dfrac{2x + 3}{26} = \dfrac{41}{4}$

$\Rightarrow 8x + 12 = 1066 \Rightarrow 8x = 1054$
$\Rightarrow x = 131.75$

157. (a) A + B

$= \left(\dfrac{2}{3} + \dfrac{4}{7} \text{ of } \dfrac{14}{12}\right) + \left(\dfrac{5}{12} \text{ of } \dfrac{7}{15} \times \dfrac{36}{21}\right)$

$= \dfrac{2}{3} + \dfrac{2}{3} + \dfrac{1}{3} = \dfrac{5}{3}$

158. (d) $\dfrac{\frac{5}{6} - \frac{5}{11} \text{ of } \left[\frac{3}{7} + \frac{8}{12} \div \frac{6}{24} + \frac{5}{7}\right]}{\frac{3}{12} \times \frac{6}{5}}$

$= \dfrac{\frac{5}{6} - \frac{5}{11} \times \frac{80}{21}}{\frac{3}{10}} = \dfrac{\frac{385 - 800}{3 \times 2 \times 77}}{\frac{3}{10}}$

$= \dfrac{-415 \times 10}{3 \times 3 \times 2 \times 77} = \dfrac{-2075}{693}$

159. (a) $\dfrac{46 + \frac{3}{4} \text{ of } 32 - 6}{37 - \frac{3}{4} \text{ of } (34 + 6)}$

$= \dfrac{46 + 24 - 6}{37 - 30} = \dfrac{64}{7}$

160. (c) $[25 + 8 \div 2 - \{16 + (14 \text{ of } 7 \div 14)$

$- (18 \div 12 \text{ of } \frac{1}{2})\}]$

$= 25 + 4 - \{16 + 7 - 3\} = 29 - 20 = 9$

161. (d) $\dfrac{1\frac{1}{2} + 1\frac{3}{7} \div \left(1\frac{3}{5} \text{ of } 1\frac{1}{4}\right) \times 2\frac{1}{3}}{2\frac{2}{3} \div \frac{4}{9} \times \frac{5}{6} + 14}$

$= \dfrac{\frac{3}{2} + \frac{10}{7} \div 2 \times \frac{7}{3}}{\frac{8}{3} \times \frac{9}{4} \times \frac{5}{6} + 14}$

$= \dfrac{\frac{3}{2} + \frac{5}{3}}{5 + 14} = \dfrac{\frac{19}{6}}{19}$

$= \dfrac{19}{6} \times \dfrac{1}{19} = \dfrac{1}{6}$

162. (d) $\left[\left(5\frac{1}{4} \div 3\frac{1}{2} \times \frac{5}{12}\right) - \frac{3}{16}\right] \div \left(3\frac{4}{7} + \frac{5}{14} \text{ of } 6\frac{2}{3}\right)$

of $1\frac{1}{3}$

$= \left[\left(\dfrac{21}{4} \times \dfrac{2}{7} \times \dfrac{5}{12}\right) - \dfrac{3}{16}\right] \div$

$\left(\dfrac{25}{7} + \dfrac{5}{14} \text{ of } \dfrac{20}{3}\right) \text{ of } \dfrac{4}{3}$

$= \left(\dfrac{5}{8} - \dfrac{3}{16}\right) \div \left(\dfrac{25}{7} \times \dfrac{42}{100}\right) \text{ of } \dfrac{4}{3}$

$= \dfrac{7}{16} \div \dfrac{3}{2} \text{ of } \dfrac{4}{3}$

$= \dfrac{7}{16} \div 2 = \dfrac{7}{32}$

163. (a) $\left(1\frac{1}{3} \div 2\frac{6}{7} \text{ of } 5\frac{3}{5}\right) \times \left(6\frac{2}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3}\right)$

$\div \left(\dfrac{3}{4} \times 2\dfrac{2}{3} \div \dfrac{5}{9} \text{ of } 1\dfrac{1}{5}\right) = k$

$\Rightarrow \left(\dfrac{4}{3} \div \dfrac{20}{7} \text{ of } \dfrac{28}{5}\right) \times \left(\dfrac{32}{5} \div \dfrac{9}{2} \text{ of } \dfrac{16}{3}\right)$

$\div \left(\dfrac{3}{4} \times \dfrac{8}{3} \div \dfrac{5}{9} \text{ of } \dfrac{6}{5}\right) = k$

$\Rightarrow \left(\dfrac{4}{3} \times \dfrac{1}{16}\right) \times \left(\dfrac{32}{5} \times \dfrac{1}{24}\right) \div \left(\dfrac{3}{4} \times \dfrac{8}{3} \times \dfrac{3}{2}\right) = k$

$\Rightarrow \dfrac{1}{12} \times \dfrac{4}{15} \times \dfrac{1}{3} = k$

$\Rightarrow \dfrac{1}{45 \times 3} = k$

$\Rightarrow k = \dfrac{1}{135} = 0.0074$

164. (d) $x = \dfrac{5\frac{3}{4} - \frac{3}{7} \times 15\frac{3}{4} + 2\frac{2}{35} \div 1\frac{11}{25}}{\frac{3}{4} \div 5\frac{1}{4} + 5\frac{3}{5} \div 3\frac{4}{15}}$

$= \dfrac{\frac{23}{4} - \frac{3}{7} \times \frac{63}{4} + \frac{72}{35} \div \frac{36}{25}}{\frac{3}{4} \div \frac{21}{4} + \frac{28}{5} \div \frac{49}{15}}$

$= \dfrac{\frac{23}{4} - \frac{27}{4} + \frac{10}{7}}{\frac{1}{7} + \frac{12}{7}} = \dfrac{-\frac{4}{4} + \frac{10}{7}}{\frac{13}{7}}$

$= \dfrac{\frac{3}{7}}{\frac{13}{7}} = \dfrac{3}{13}$

$\because x + y = \dfrac{7}{13}$

$\Rightarrow y = \dfrac{7}{13} - \dfrac{3}{13} = \dfrac{4}{13}$

165. (a) $9 \div \left\{\dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4} + \dfrac{1}{6} \div \left(\dfrac{3}{4} - \dfrac{1}{3}\right) \text{ of } \dfrac{2}{9}\right\}$

$= 9 \div \left\{\dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4} + \dfrac{1}{6} \times \dfrac{54}{5}\right\}$

$= 9 \div \left\{\dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4} + \dfrac{9}{5}\right\}$

$= 9 \div \left\{\dfrac{30 + 20 + 15 + 108}{60}\right\}$

$= 9 \div \left\{\dfrac{173}{60}\right\} = 9 \times \dfrac{60}{173} = \dfrac{540}{173}$

166. (d) $\dfrac{3}{8} + \dfrac{1}{7} \times 1\dfrac{3}{4} + \left(\dfrac{2}{3} \div \dfrac{3}{10} \text{ of } \dfrac{4}{9}\right) -$

$\left(3\dfrac{1}{5} \div 4\dfrac{1}{2} \text{ of } 5\dfrac{1}{3}\right) \times \dfrac{15}{8}$

$= \dfrac{3}{8} + \dfrac{1}{7} \times \dfrac{7}{4} + \left(\dfrac{2}{3} \div \dfrac{3}{10} \times \dfrac{4}{9}\right)$

$- \left(\dfrac{16}{5} \div \dfrac{9}{2} \text{ of } \dfrac{16}{3}\right) \times \dfrac{15}{8}$

$= \dfrac{3}{8} + \dfrac{1}{4} + \left(\dfrac{2}{3} \div \dfrac{2}{15}\right) - \left(\dfrac{16}{5} \div 24\right) \times \dfrac{15}{8}$

$= \dfrac{3}{8} + \dfrac{1}{4} + \left(\dfrac{2}{3} \times \dfrac{15}{2}\right) - \left(\dfrac{16}{5} \times \dfrac{1}{24}\right) \times \dfrac{15}{8}$

$= \dfrac{3}{8} + \dfrac{1}{4} + (5) - \left(\dfrac{2}{15}\right) \times \dfrac{15}{8}$

$= \dfrac{3}{8} + \dfrac{1}{4} + 5 - \dfrac{1}{4} = \dfrac{3}{8} + 5 = 5\dfrac{3}{8}$

167. (d) $4\frac{2}{5} \div \{(1\frac{1}{2} - 3\frac{1}{5}) \div 3\frac{2}{5} + (2\frac{1}{5} \div 1\frac{1}{2} + 4\frac{2}{5}) + \frac{1}{2}\}$

$= \dfrac{22}{5} \div \left\{\left(\dfrac{3}{2} - \dfrac{16}{5}\right) \div \dfrac{17}{5} + \left(\dfrac{11}{5} \div \dfrac{3}{2} + \dfrac{22}{5}\right) + \dfrac{1}{2}\right\}$

$= \dfrac{22}{5} \div \left\{\left(-\dfrac{17}{10}\right) \times \dfrac{5}{17} + \left(\dfrac{11}{5} \times \dfrac{2}{3} + \dfrac{22}{5}\right) + \dfrac{1}{2}\right\}$

$= \dfrac{22}{5} \div \left\{-\dfrac{1}{2} + \left(\dfrac{88}{15}\right) + \dfrac{1}{2}\right\}$

$= \dfrac{22}{5} \div \left\{\dfrac{88}{15}\right\} = \dfrac{22}{5} \times \dfrac{15}{88} = \dfrac{3}{4}$

168. (a) ATQ,

$\dfrac{52 - 1170 \div 26 + 13 \times 2}{2 + 1\frac{1}{8} \text{ of } 2 - 1\frac{1}{4}} = \dfrac{52 - \frac{1170}{26} + 26}{2 + \frac{9}{4} - \frac{5}{4}}$

$= \dfrac{52 - 45 + 26}{3}$

$= \dfrac{78 - 45}{3} = 11$

169. (a) ATQ,

$$441 \div \left[270 \div \frac{3}{7} + \left(17 + \frac{1}{3}\right) - \left(8\frac{1}{2} - \frac{5}{2}\right)\right]$$

$$= 441 \div \left[270 \times \frac{7}{3} + 51 - \left(\frac{17}{2} - \frac{5}{2}\right)\right]$$

$$= 441 \div [630 + 51 - 6]$$

$$= \frac{441}{675} = \frac{49}{75}$$

170. (a) $[\{(232 \div 29 \text{ of } 2) + 77 \times 10\} \div 18] - \frac{18 \times 8 \div 4 \text{ of } 3 - 4}{2 \times (8 - 6) + 1 - 2 \times 3 \div 4 \text{ of } \frac{1}{2}}$

$= [\{(232 \div 58) + 770\} \div 18] - \frac{18 \times 8 \div 12 - 4}{2 \times 2 + 1 - 2 \times 3 \div 2}$

$$= \left[\left\{\frac{774}{18}\right\}\right] - \frac{12 - 4}{4 + 1 - 3}$$

$$= \left[43 - \frac{8}{2}\right] = 39$$

171. (a) $18\frac{2}{11} \div \left[\frac{7}{33} + \left\{\frac{29}{6} - \frac{3}{11} \times \left(5\frac{1}{6} - 3\frac{1}{3}\right)\right\}\right]$

$$= \frac{200}{11} \div \left[\frac{7}{33} + \left\{\frac{29}{6} - \frac{3}{11} \times \frac{11}{6}\right\}\right]$$

$$= \frac{200}{11} \div \left[\frac{7}{33} + \frac{26}{6}\right] = \frac{200}{11} \times \frac{33}{150} = 4$$

172. (c) $\frac{a^7 \times b^8 \times c^7}{a^9 \times b^5 \times c^4} = \frac{b^3 \times c^3}{a^2}$

$= a^{-2} b^3 c^3$

173. (a) $\frac{a^5 \times b^3 \times c^7}{a^4 \times b^8 \times c^9} = \frac{a}{b^5 \times c^2}$

$= a \times b^{-5} \times c^{-2}$

174. (d) 95×105

$= (100 - 5)(100 + 5) = (100)^2 - (5)^2$

$= 10000 - 25 = 9975$

SMART APPROACH:-

∴ 95 and 105 multiple of 5 and 5 respectively, so answer must be multiple of 25, option (d) satisfied

175. (b) $1801 \times 1801 = (1801)^2$

$= (1800 + 1)^2$

$= 1800^2 + 2 \times 1800 \times 1 + 1^2$

$= 3240000 + 3600 + 1$

$= 3243601$

176. (a) $52 \times 52 - 48 \times 48$

$= (52 + 48)(52 - 48)$

$= 100 \times 4 = 400$

177. (d) $\frac{(525+175)^2 - (525-175)^2}{525 \times 175}$

$[\therefore (a + b)^2 - (a - b)^2 = 4ab]$

$$= \frac{4 \times 525 \times 175}{525 \times 175} = 4$$

178. (b) $A = \frac{58^2 - 25^2}{46^2 - 37^2} = \frac{83 \times 33}{83 \times 9} = \frac{11}{3}$

$B = \frac{26^2 - 15^2}{56^2 - 15^2} = \frac{41 \times 11}{71 \times 41} = \frac{11}{71}$

$\therefore \frac{1}{B} - \frac{20}{A} = \frac{71}{11} - \frac{20 \times 3}{11} = 1$

179. (c) $(x + y)^2 + (x - y)^2 = 2(x^2 + y^2)$

$$\frac{(612 + 388)^2 + (612 - 388)^2}{(612 \times 612) + (388 \times 388)}$$

$$= \frac{2 \times \left[(612)^2 + (388)^2\right]}{(612)^2 + (388)^2} = 2$$

180. (d) $(2z - 5y)^2 + (5z + 2y)^2 - 25z^2$

$= 4z^2 + 25y^2 - 20zy + 25z^2 + 4y^2 + 20yz - 25z^2$

$= 29y^2 + 4z^2$

Alternate Method:-

Put $z = 1$, $y = 1$

$\therefore (2 - 5)^2 + (5 + 2)^2 - 25$

$= 9 + 49 - 25 = 33$

$\therefore 29y^2 + 4z^2 = 29 + 4 = 33$

181. (b) $\frac{(25)^4 + 1250 + 1 - (25)^2}{(25)^2 + 25 + 1}$

$$= \frac{390625 + 1251 - 625}{651} = \frac{391251}{651}$$

$= 601$

Alternate Method:

$$\frac{(25)^4 + 1250 + 1 - (25)^2}{(25)^2 + 25 + 1}$$

$$= \frac{(25^2)^2 + 1250 + 1 - (25)^2}{(25)^2 + 25 + 1}$$

$$= \frac{(25^2 + 1)^2 - (25)^2}{(25)^2 + 25 + 1} = \frac{(25^2 + 1 - 25)(25^2 + 1 + 25)}{(25)^2 + 1 + 25}$$

$= 625 + 1 - 25 = 601$

182. (a) $\frac{0.7^2 + (0.4 + 0.2)(0.7) + (0.4 \times 0.2)}{(0.7 + 0.4)}$

$$= \frac{0.49 + 0.42 + 0.08}{1.1} = 0.9$$

Alternate Method:

(Using Digital-Sum Method)

$$= \frac{49 + 42 + 8}{11}$$

$$= \frac{4 + 6 + 8}{2} = 9$$

So, option (a) satisfy

183. (b) $\frac{((32)^4 - 1)}{33 \times 31 \times (2^{10} + 1)}$

$$= \frac{(32^2 - 1)(32^2 + 1)}{33 \times 31 \times (2^{10} + 1)}$$

$\{\because a^2 - b^2 = (a + b)(a - b)\}$

$$= \frac{(32 + 1)(32 - 1)(32^2 + 1)}{33 \times 31 \times (2^{10} + 1)}$$

$$= \frac{33 \times 31 \times (32^2 + 1)}{33 \times 31 \times (2^{10} + 1)}$$

$$= \frac{32^2 + 1}{(2^{10} + 1)} \quad \left(\because \begin{matrix} 2^5 = 32 \\ 2^{10} = 32^2 \end{matrix}\right)$$

$$= \frac{32^2 + 1}{32^2 + 1} = 1$$

184. (d) $\therefore \frac{(157 \times 157) + (157 \times 133) + (133 \times 1}{(157 \times 157) - (133 \times 133 \times 133)}$

$$\because \frac{a^2 + ab + b^2}{a^3 - b^3} = \frac{a^2 + b^2 + ab}{(a - b)(a^2 + b^2 + ab)}$$

$$= \frac{1}{a - b} = \frac{1}{157 - 133} = \frac{1}{24}$$

185. (c) $\frac{256x^4 - 16y^4}{(80x^2 - 20y^2)(16x^2 + 4y^2)}$

$$= \frac{(16x^2)^2 - (4y^2)^2}{20(4x^2 - y^2) \times 4(4x^2 + y^2)}$$

$$= \frac{(16x^2 + 4y^2)(16x^2 - 4y^2)}{80(4x^2 - y^2)(4x^2 + y^2)}$$

$$= \frac{4(4x^2 + y^2)(4x + 2y)(4x - 2y)}{80(2x + y)(2x - y)(4x^2 + y^2)}$$

$$= \frac{4 \times 2 \times 2(2x + y)(2x - y)}{80 \times (2x + y)(2x - y)}$$

$$= \frac{16}{80} = \frac{1}{5}$$

Alternate Method:

Put, y = 0 in the given expression

$$\frac{256x^4 - 16y^4}{(80x^2 - 20y^2)(16x^2 + 4y^2)}$$

$$= \frac{256x^4}{80x^2 \times 16x^2} = \frac{1}{5}$$

186. (a) $\frac{s^2 + t^2 + 2st - u^2}{s^2 - t^2 - 2tu - u^2} = \frac{(s + t)^2 - u^2}{s^2 - (t + u)^2}$

$$= \frac{(s + t + u)(s + t - u)}{(s - t - u)(s + t + u)} = \frac{s + t - u}{s - t - u}$$

187. (a) $(5z - 12y)^2 + (12z + 5y)^2 - 144z$

$= 25z^2 + 144y^2 - 120zy + 144z^2$

$25y^2 + 120yz - 144z^2$

$= 25z^2 + 144y^2 + 25y^2$

$= 25z^2 + 169y^2$

188. (a) $(5z - 7y)^2 + (7z + 5y)^2 - 49z^2$

$= 25z^2 + 49y^2 - 70zy + 49z^2 + 25y$

$- 49z^2$

$= 25z^2 + 49y^2 + 25y^2$

$= 25z^2 + 74y^2$

189. (d) $(a + b + c)^2 = (a^2 + b^2 + c^2) + (2a$

$+ 2bc + 2ca)$

$$\frac{0.09 \times 0.09 + 0.04 \times 0.04 + 0.16 \times 0.16 + 2 \times 0.09 \times 0.04 + 2 \times 0.04 \times 0.16 + 2 \times 0.09 \times 0.1}{0.3 \times 0.3 + 0.2 \times 0.2 + 0.4 \times 0.4}$$

$$\frac{\{(.09^2 + .04^2 + .16^2) + (2 \times 0.09 \times 0.04 + 2 \times 0.04 \times 0.16 + 2 \times 0.09 \times 0.16)\}}{(0.09 + 0.04 + 0.16)}$$

$$= \frac{(.09 + .04 + .16)^2}{(0.09 + 0.04 + 0.16)}$$

$= (.09 + 0.4 + .16) = 0.29$

190. (b) $(a+b+c)^2 = a^2+b^2+c^2+2(ab+bc+ca)$

$0.01 + 0.68 \times 0.68 + 0.22 \times 0.22 + 0.0044 + 0.0136 + 0.44 \times 0.68$

$= (0.10 + 0.68 + 0.22)^2 = (1)^2 = 1$

191. (a) $$\frac{\begin{array}{c}0.325\times0.325+0.175\\ \times0.175+25\times0.00455\end{array}}{\begin{array}{c}5\times0.0065\times3.25\\ -7\times0.175\times0.025\end{array}}-\frac{0.5}{1.5}$$

$$=\frac{\begin{array}{c}0.325\times0.325+0.175\times\\ 0.175+0.175\times0.65\end{array}}{0.325\times0.325-0.175\times0.175}-\frac{0.5}{1.5}$$

$$=\frac{\begin{array}{c}0.325\times0.325+0.175\times\\ 0.175+0.175\times0.325\times2\end{array}}{0.325\times0.325-0.175\times0.175}-\frac{0.5}{1.5}$$

$\because$ a = 0.325, b = 0.175

$$=\frac{(0.325+0.175)^2}{0.325^2-0.175^2}-\frac{0.5}{1.5}$$

$$=\frac{0.325+0.175}{0.325-0.175}-\frac{0.5}{1.5}$$

$$=\frac{0.5}{0.15}-\frac{0.5}{1.5}=\frac{50}{15}-\frac{5}{15}=\frac{45}{15}=3$$

192. (b) $$\frac{1}{4}+\frac{[(20.35)^2-(8.35)^2]\times0.0175}{(1.05)^2+(1.05)(27.65)}$$

$$=\frac{1}{4}+\frac{28.7\times12\times0.0175}{1.05(28.7)}$$

$$=\frac{1}{4}+\frac{12\times175}{105\times100}=\frac{1}{4}+\frac{1}{5}=\frac{9}{20}$$

193. (d) $$\frac{2.5\times2.5+0.3\times0.3+5\times0.3}{1.6\times1.6+0.6\times0.6-1.2\times1.6}$$

$$=\frac{(2.5)^2+(0.3)^2+2\times2.5\times0.3}{(1.6)^2+(0.6)^2-2\times1.6\times0.6}$$

$$=\frac{(2.5+0.3)^2}{(1.6-0.6)^2}=\frac{(2.8)^2}{1}=7.84$$

194. (a) We know,

If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3abc$

Here, a = 25, b = –75, c = 50

and $a + b + c = 0$

$25^3 - 75^3 + 50^3$

$= (-3) \times 25 \times 75 \times 50 = -281250$

Alternate Method:

Apply digital sum

$(7)^3 - (12)^3 + (5)^3$

$= 343 - (3)^3 + 125$

$= 343 - 27 + 125$

$= 10 - 9 + 8 = 1 - 0 + 8 = 9$

Option (a) is correct

195. (c) If $a + b + c = 0$

then,

$a^3 + b^3 + c^3 = 3abc$

$\therefore (1+x)^3 + (1-x)^3 + (-2)^3$

$= 3(1+x)(1-x)(-2) = -6(1-x^2)$

Alternate Method:

Put, $x = 0$, $1 + 1 - 8 = -6$

after putting $x = 0$ in the given options only (c) satisfied.

196. (d) $\because \dfrac{a^3-b^3}{a^2+ab+b^2}=(a-b)$

$$\therefore \frac{(0.83)^3-(0.1)^3}{(0.83)^2+0.083+0.01}$$

$= (0.83 - 0.1) = 0.73$

197. (b) We know that

$$\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca}=(a+b+c)$$

$$\therefore \frac{\begin{array}{c}(8.3)^3+(9.2)^3+(6.1)^3\\ -3\times8.3\times9.2\times6.1\end{array}}{\begin{array}{c}(8.3)^2+(9.2)^2+(6.1)^2-8.3\times9.2\\ -9.2\times6.1-6.1\times8.3\end{array}}$$

$= 8.3 + 9.2 + 6.1$

$= 23.6$

198. (b) $\dfrac{a^3-b^3}{a^2+b^2+ab}=(a-b)$

$$\therefore \frac{(4.2-1.2)(4.2^2+1.2^2+5.04)}{(4.2^2+1.2^2+5.04)}$$

$= 4.2 - 1.2 = 3$

199. (c) We know,

$$\frac{a^3-b^3}{a^2+b^2+ab}=(a-b)$$

$$\therefore \frac{(7.3)^3-(4.7)^3}{(7.3)^2+7.3\times4.7+(4.7)^2}$$

$= 7.3 - 4.7 = 2.6$

200. (b)

$$\frac{(232)^3+(140)^3+(353)^3-3\times232\times140\times353}{(232)^2+(140)^2+(353)^2-232\times140-140\times353-353\times232}$$

We know,

$$\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-ac-cb}=(a+b+c)$$

$= 232 + 140 + 353 = 725$

201. (d) We know,

$$\frac{a^3-b^3}{a^2+b^2+ab}=(a-b)$$

$$\therefore \frac{453\times453\times453-383\times383\times383}{453\times383+383\times383+453\times453}$$

$$=\frac{(453)^3-(383)^3}{(383)^2+(453)^2+453\times383}$$

$= 453 - 383 = 70$

202. (a) We know that,

$$(a-b)=\frac{a^3-b^3}{(a^2+b^2+ab)} \text{ and}$$

$$(a+b)=\frac{a^3+b^3}{(a^2+b^2-ab)}$$

ATQ,

Let, a = 275, B = 725

Now,

$(a + b) = (275 + 725) = 1000$

$(a - b) = (275 - 725) = -450$

$\Rightarrow 1000 \times (-450) = -450000$

203. (a) Numerator follows $(a-b)^3$ where a = 8.25, b = 0.25

$$=\frac{(8.25-0.25)^3}{4\times4\times4}=\frac{8\times8\times8}{4\times4\times4}=8$$

204. (d) $a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

ATQ,

$$=\frac{\begin{array}{c}[(2.3+15.9+3.7)[(2.3)^2+(15.9)^2+(3.7)^2\\ -2.3\times15.9-15.9\times3.7-2.3\times3.7)]\end{array}}{\begin{array}{c}[(2.3)^2+(15.9)^2+(3.7)^2-2.3\times15.9\\ -15.9\times3.7-2.3\times3.7]\end{array}}$$

$= 2.3 + 15.9 + 3.7 = 21.9$

205. (c) Let, a = 12.43, b = 19.57

$\because a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

ATQ,

$$\Rightarrow \frac{a^3+b^3}{a^2-a\times b+b^2}=a+b$$

$= 12.43 + 19.57 = 32$

206. (d) Let, a = 15, b = 13

$\because (a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

$\therefore 15^3 + 3 \times 15 \times 12^2 - 3 \times 15^2 \times 12 - 12^3 = (15-12)^3 = 27$

207. (b) $(x-3y)^3 + 27(y^3 - xy^2)$

$= x^3 - 27y^3 - 9xy(x-3y) + 27y^3 - 27xy^2$

$= x^3 - 9x^2y + 27xy^2 - 27xy^2$

$= x^3 - 9x^2y$

208. (d) $a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

Let, a = 1.5, a = 2.7, c = 4.8

$$\frac{a^3+b^3+c^3-3abc}{a^3+b^3+c^3-ab-bc-ca}=a+b+c$$

So, $a + b + c = 1.5 + 2.7 + 4.8 = 9$

209. (c) $(0.2)^3 + (0.3)^3 + (0.5)^3 + 3 \times 0.5 \times 0.7 \times 0.8$

$$=\frac{8}{1000}+\frac{27}{1000}+\frac{125}{1000}+\frac{840}{1000}$$

$$=\frac{1000}{1000}=1$$

210. (a) $$\frac{\begin{array}{c}(3.254\times3.254\times3.254)-\\ (0.746\times0.746\times0.746)\end{array}}{\begin{array}{c}(3.254\times3.254)+(0.746\times0.746)\\ +(3.254\times0.746)\end{array}}$$

$$\because \frac{a^3-b^3}{a^2+b^2+ab}=a-b$$

$= 3.254 - 0.746 = 2.508$

211. (c) $\because \dfrac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca}=(a+b+c)$

$$=\frac{\begin{array}{c}(3.321)^3+(2.681)^3+(1.245)^3\\ -3\times3.321\times2.681\times1.1245\end{array}}{\begin{array}{c}(3.321)^2+(2.681)^2+(1.245)^2\\ -(3.321\times2.681)-(2.681\times1.245)\\ -(1.245)\times3.321\end{array}}$$

$= (3.321 + 2.681 + 1.245) = 7.247$

Alternate Method:

Do not try to do the calculation. Check the answer by unit digit only

212. (b) $\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca}$

$= a + b + c$

$$\frac{(80\times80\times80)+(70\times70\times70)+(50\times50\times50)-840000}{6400+4900+2500-5600-3500-4000}$$

$$=\frac{(80)^3+(70)^3+(50)^3-3\times80\times70\times50}{(80)^2+(70)^2+(50)^2-80\times70-70\times50-50\times80}$$

$= (80 + 70 + 50) = 200$

213. (d) $(a^{-1}+b^{-1})\div(a^{-3}+b^{-3})$

$=\left(\frac{1}{a}+\frac{1}{b}\right)\div\left(\frac{1}{a^3}+\frac{1}{b^3}\right)$

$=\left(\frac{a+b}{ab}\right)\times\left(\frac{a^3b^3}{a^3+b^3}\right)=\frac{a^2b^2}{a^2-ab+b^2}$

214. (a) We know,

$\frac{a^3-b^3}{a^2+b^2+ab}=(a-b)$

$$\frac{0.58\times0.58\times0.58-0.001}{0.58\times0.58+0.058+0.01}$$

$$=\frac{(0.58)^3-(0.10)^3}{(0.58)^2+(0.1)^2+(0.1\times0.58)}$$

$= 0.58 - 0.10 = 0.48$

215. (d)

$$\frac{1.5\times1.5+2.5\times2.5+3.5\times3.5+2\times1.5\times2.5+2\times2.5\times3.5+2\times1.5\times3.5}{1.5+2.5+3.5}$$

$\because a^2+b^2+c^2+2ab+2bc+2ca=(a+b+c)^2$

$\Rightarrow \frac{(1.5+2.5+3.5)^2}{1.5+2.5+3.5} = 1.5 + 2.5 + 3.5 = 7.5$

216. (b) Given, $\frac{15}{7},\frac{5}{11},\frac{21}{77}$

LCM of 7, 11, 77 = 77

$\frac{15}{7}\times\frac{11}{11},\frac{5}{11}\times\frac{7}{7},\frac{21}{77}$

$\frac{165}{77},\frac{35}{77},\frac{21}{77}=\frac{165}{77}>\frac{35}{77}>\frac{21}{77}$

$\therefore$ 15:7>5:11>21:77

217. (b) $\frac{17}{30},\frac{7}{15},\frac{27}{50},\frac{11}{20}$

LCM of 30, 15, 50, 20 = 300

$\frac{170}{300},\frac{140}{300},\frac{162}{300},\frac{165}{300}$

Descending order : $\frac{17}{30}>\frac{11}{20}>\frac{27}{50}>\frac{7}{15}$

218. (b) $\frac{5}{11},\frac{7}{12},\frac{8}{13},\frac{9}{17}$

$\frac{5}{11}\times\frac{7}{12}\Rightarrow\frac{7}{12}>\frac{5}{11}$ .....(i)

60 < 77

$\frac{5}{11}\times\frac{8}{13}\Rightarrow\frac{5}{11}<\frac{8}{13}$ .....(ii)

65 < 88

$\frac{5}{11}\times\frac{9}{17}\Rightarrow\frac{5}{11}<\frac{9}{17}$ ...(iii)

85 < 99

From (i), (ii) and (iii)

$\frac{5}{11}$ is the least number.

219. (c) $\frac{3}{4}=0.75,\ \frac{3}{5}=0.60$

$\frac{2}{11}=0.18,\ \frac{7}{2}=3.5$

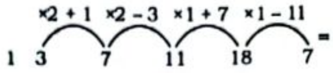
It is clear that,

2 : 11 < 3 : 5 < 3 : 4 < 7 : 2

220. (b) $1-\cfrac{7}{1-\cfrac{1}{1+\cfrac{7}{-6}}}$

$=1-\cfrac{7}{1-\cfrac{-6}{1}}=1-\frac{7}{7}=0$

221. (c) $1-\cfrac{1}{1+\cfrac{1}{2-\cfrac{1}{2+\cfrac{1}{3}}}}$



$=\frac{7}{18}$

222. (c) $\cfrac{3y}{1+\cfrac{1}{1+\cfrac{y}{1-y}}}=2$

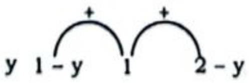
$\Rightarrow \frac{3y}{2-y}=2$

$\Rightarrow 3y = 4 - 2y$

$\Rightarrow 5y = 4 \Rightarrow y=\frac{4}{5}$

Alternate Method:

$1+\cfrac{1}{1+\cfrac{y}{1-y}}$



$\frac{3y}{2-y}=2\Rightarrow 3y=4-2y$

$\Rightarrow 5y = 4$

$\Rightarrow y=\frac{4}{5}$

223. (a) $\left\{4-\cfrac{2}{1+\cfrac{2}{1-\cfrac{1}{2+\cfrac{3}{4}}}}\right\}\div1\frac{5}{12}$ of $\frac{72}{145}-(4+3\div0.5-1)$

$=\left\{4-\cfrac{2}{1+\cfrac{2}{1-\cfrac{4}{11}}}\right\}\div\frac{17}{12}\times\frac{72}{145}-(4+6-1)$

$=\left\{4-\cfrac{2}{1+\cfrac{22}{7}}\right\}\div\frac{102}{145}-(9)$

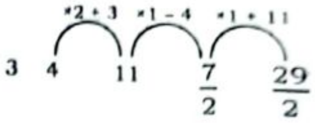
$=\left(4-\frac{14}{29}\right)\div\frac{102}{145}-(9)$

$=\left\{\frac{102}{29}\right\}\div\frac{102}{145}-(9)$

$=\left\{\frac{102}{29}\right\}\times\frac{145}{102}-(9)=5-9=-4$

Alternate Method:

$1+\cfrac{2}{1-\cfrac{1}{2+\cfrac{3}{4}}}$



$\cfrac{\frac{29}{2}}{\frac{7}{2}}=\frac{29}{7}$

$\because \left\{4-\cfrac{2}{1+\cfrac{2}{1-\cfrac{1}{2+\cfrac{3}{4}}}}\right\}\div1\frac{5}{12}$ of $\frac{72}{145}-(4+3\div0.5-1)$

$=\left(4-2\times\frac{7}{29}\right)\div\frac{17}{12}$ of $\frac{72}{145}-\left(4+\frac{3}{0.5}-1\right)$

$=\frac{102}{29}\div\frac{102}{145}-9=\frac{102}{29}\times\frac{145}{102}-9$

$= 5 - 9 = -4$

224. (d) $\cfrac{1}{x+\cfrac{1}{y+\cfrac{2}{z+\cfrac{1}{4}}}}=\frac{29}{79}$

$\frac{79}{29}=2+\frac{21}{29}\Rightarrow x=2$

$\frac{29}{21}=1+\frac{2\times4}{21}\Rightarrow y=1$

$\frac{21}{4}=5+\frac{1}{4}\Rightarrow z=5$

$\therefore 2x+3y-z=4+3-5=2$

Alternate Method:

```
29) 79 (2 → x
    58
    21) 29 (1 → y
        21
         8) 21 (2
            16
             5 → z
```

$\therefore 2x+3y-z=4+3-5=2$

225. (c) $11.\bar{4}+22.5\overline{67}-33.5\bar{9}$

Integer part = 11 + 22 − 33 = 0

$$=0.\bar{4}+0.5\overline{67}-0.5\bar{9}$$

$$=\frac{4}{9}+\frac{(567-5)}{990}-\frac{(59-5)}{90}$$

$$=\frac{4}{9}+\frac{562}{990}-\frac{54}{90}$$

$$=\frac{440+562-594}{990}=\frac{408}{990}$$

$$=\frac{412-4}{990}=0.4\overline{12}$$

Alternate Method:

11	4	44	44
22	5	67	67
−33	5	99	99
00.	4	12	12

$= .4\overline{12}$

SMART APPROACH:-

Maximum bar = 2
Maximum no bar = 1
Value = $0.a\overline{bc}$
In the given option,
$0.4\overline{12}$ is the correct option.

226. (b) $0.4\bar{6}+0.7\overline{23}-0.3\bar{9}\times0.\bar{7}$

$$=\frac{46-4}{90}+\frac{723-7}{990}-\frac{(39-3)}{90}\times\frac{7}{9}$$

$$=\frac{42}{90}+\frac{716}{990}-\frac{36}{90}\times\frac{7}{9}$$

$$=\frac{42}{90}+\frac{716}{990}-\frac{28}{90}$$

$$=\frac{14}{90}+\frac{716}{990}=\frac{154+716}{990}=\frac{870}{990}=0.\overline{87}$$

227. (d) $A=0.3\overline{12}=\frac{312-3}{990}=\frac{309}{990}$

$$B=0.4\overline{15}=\frac{415-4}{990}=\frac{411}{990}$$

$$C=0.30\bar{9}=\frac{309-30}{900}=\frac{279}{900}$$

$$\therefore A+B+C=\frac{309}{990}+\frac{411}{990}+\frac{279}{900}$$

$$=\frac{10269}{9900}=\frac{1141}{1100}$$

228. (d) I. $\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\ldots\ldots+\frac{1}{110}<\frac{5}{6}$

$$=\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+\ldots+\frac{1}{10\times11}$$

$$=1-\frac{1}{11}=\frac{10}{11}$$

$$\because\frac{10}{11}>\frac{5}{6}$$

II. $\frac{1}{3}+\frac{1}{15}+\frac{1}{35}+\ldots\ldots+\frac{1}{143}>\frac{7}{13}$

$$=\frac{1}{1\times3}+\frac{1}{3\times5}+\frac{1}{5\times7}+\ldots+\frac{1}{11\times13}$$

$$=\frac{1}{2}\left[\frac{1}{1}-\frac{1}{3}+\frac{1}{3}-\frac{1}{5}+\ldots+\frac{1}{11}-\frac{1}{13}\right]$$

$$=\frac{1}{2}\left[1-\frac{1}{13}\right]=\frac{1}{2}\times\frac{12}{13}=\frac{6}{13}$$

$$\because\frac{6}{13}<\frac{7}{13}$$

Neither I nor II is correct.

229. (c) (I) $\frac{1}{2}+\frac{1}{6}+\frac{1}{12}=\frac{3}{4}$

$$\Rightarrow\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}=\frac{3}{4}$$

$$\Rightarrow\left[\frac{1}{1}-\frac{1}{2}+\frac{1}{2}-\frac{1}{3}+\frac{1}{3}-\frac{1}{4}\right]=\frac{3}{4}$$

$$\Rightarrow\left[\frac{1}{1}-\frac{1}{4}\right]=\frac{3}{4}$$

$$\Rightarrow\frac{3}{4}=\frac{3}{4}\text{ (Satisfied)}$$

(II) $\frac{1}{6}+\frac{1}{12}+\frac{1}{20}=\frac{3}{5}$

$$\Rightarrow\frac{1}{2\times3}+\frac{1}{3\times4}+\frac{1}{4\times5}=\frac{3}{5}$$

$$\frac{1}{2}-\frac{1}{3}+\frac{1}{3}-\frac{1}{4}+\frac{1}{4}-\frac{1}{5}=\frac{3}{10}$$

$$=\frac{3}{10}\neq\frac{3}{5}\text{ (not satisfied)}$$

230. (b) $\frac{7}{2}+\frac{11}{3}+\frac{7}{6}+\frac{11}{15}+\frac{7}{12}+\frac{11}{35}+\ldots+\frac{7}{156}+\frac{11}{575}$

It is a combination of two series.

$$S_1=\frac{7}{2}+\frac{7}{6}+\frac{7}{12}+\ldots+\frac{7}{156}$$

$$=7\left[\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\ldots+\frac{1}{156}\right]$$

$$=7\left[\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}\ldots\ldots+\frac{1}{12\times13}\right]$$

$$=7\left[1-\frac{1}{13}\right]=\frac{84}{13}$$

$$S_2=\frac{11}{3}+\frac{11}{15}+\frac{11}{35}+\ldots+\frac{11}{575}$$

$$=11\left(\frac{1}{3}+\frac{1}{15}+\frac{1}{35}+\ldots+\frac{1}{575}\right)$$

$$=11\left[\frac{1}{1\times3}+\frac{1}{3\times5}+\frac{1}{5\times7}\ldots\ldots+\frac{1}{23\times25}\right]$$

$$=\frac{11}{2}\left[1-\frac{1}{25}\right]=\frac{132}{25}$$

$$\therefore S_1+S_2=\frac{84}{13}+\frac{132}{25}$$

$$=\frac{2100+1716}{325}=\frac{3816}{325}$$

231. (d) $\frac{3}{70}+\frac{1}{42}+\frac{1}{66}+\frac{3}{286}+\frac{1}{130}+\frac{1}{170}$

$$=\frac{1}{7}\left(\frac{3}{10}+\frac{1}{6}\right)+\frac{1}{66}+\frac{3}{286}+\frac{1}{130}+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{66}+\frac{3}{286}+\frac{1}{130}+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{22}\left(\frac{1}{3}+\frac{3}{13}\right)+\frac{1}{130}+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{22}\times\frac{22}{39}+\frac{1}{130}+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{39}+\frac{1}{130}+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{13}\left(\frac{1}{3}+\frac{1}{10}\right)+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{13}\left(\frac{13}{30}\right)+\frac{1}{170}$$

$$=\frac{1}{15}+\frac{1}{30}+\frac{1}{170}$$

$$=\frac{1}{15}\left(1+\frac{1}{2}\right)+\frac{1}{170}=\frac{1}{10}+\frac{1}{170}$$

$$=\frac{18}{170}=\frac{9}{85}$$

232. (b) $\frac{4}{3\times7}+\frac{6}{7\times13}+\frac{8}{13\times21}+\frac{10}{21\times31}+\frac{12}{31\times43}$

$$=\frac{1}{3}-\frac{1}{43}=\frac{43-3}{3\times43}=\frac{40}{129}$$

233. (d) $\frac{1}{8}+999\frac{791}{792}\times99$

$$=\frac{1}{8}+\left(999+\frac{791}{792}\right)\times99$$

$$=\frac{1}{8}+\left(999+1-\frac{1}{792}\right)\times99$$

$$=\frac{1}{8}+\left(1000-\frac{1}{792}\right)\times99$$

$$=\frac{1}{8}+\left(99000-\frac{1}{8}\right)=99000$$

SMART APPROACH:-

In this pattern, $\frac{791}{792}$) diff. = 1

$\frac{791}{792}\times99$ ×8 It is divisible by 8,
So, $\frac{1}{8}$ is subtracted.

$$999\frac{791}{792}\times99\ \downarrow\ 99\underline{000}$$

As many 0's will be added as many times as there are 9's before the fraction

234. (a) $\underbrace{1-2}_{-1}+\underbrace{3-4}_{-1}+\underbrace{5-6}_{-1}+\ \ldots\ldots$ to 100 terms

from every two terms we get −1
then from 100 terms we get − 50

235. (d) $4^2-3^2+6^2-5^2+8^2-7^2+\ldots\ldots+92^2-91^2$

$=(4-3)(4+3)+(6-5)(6+5)+(8-7)(8+7)+\ldots.+(92-91)(92+91)$

$=7+11+15+19+\ldots\ldots+183$

First term = 7, Last term = 183

Diff. = 4

$n=\frac{183-7}{4}+1=45$

$S_n=\frac{45}{2}[7+183]=45\times95=4275$

Note:- Given eq. is multiple of 9.

Then option (d) = 4275

236. (b) $98^2-97^2+96^2-95^2+94^2-93^2+\ldots12^2-11^2$

$=(98-97)(98+97)+(96-95)(96+95)+(94-93)(94-92)\ldots\ldots+(12-11)(12+11)$

$=195+191+187\ldots..+23$

First = 195, Last = 23, diff. = 4

$n=\frac{195-23}{4}+1=44$

$S_n=44\times109=4796$

237. (a) $(0.00243)^{0.2}=\left(\frac{243}{100000}\right)^{\frac{1}{5}}$

$=\left(\frac{3}{10}\right)^{5\times\frac{1}{5}}=\frac{3}{10}=0.3$

238. (b) $\sqrt{[(7^2+6^3+9^2)\div2+52]}$

$=\sqrt{[(49+216+81)\div2+52]}$

$=\sqrt{[346\div2+52]}=\sqrt{[225]}=15$

239. (b) $\sqrt{36\div15 \text{ of } 2 \text{ of }\left[\begin{matrix}25\times4\div4 \text{ of}\\ \left\{\begin{matrix}29-(8-11)\\ \div(9\times5\div5 \text{ of } 3)\end{matrix}\right\}\end{matrix}\right]}$

$=\sqrt{36\div15 \text{ of } 2 \text{ of }\left[\begin{matrix}25\times4\div4 \text{ of}\\ \left\{\begin{matrix}29+3\div\\ (45\div15)\end{matrix}\right\}\end{matrix}\right]}$

$=\sqrt{36\div15 \text{ of } 2 \text{ of }\left[\begin{matrix}100\div4 \text{ of}\\ \{29+3\div3\}\end{matrix}\right]}$

$=\sqrt{36\div15 \text{ of } 2 \text{ of }[100\div4 \text{ of}30]}$

$=\sqrt{36\div15 \text{ of } 2 \text{ of }[100\div120]}$

$=\sqrt{36\div15 \text{ of } 2 \text{ of }\frac{5}{6}}$

$=\sqrt{\frac{36}{25}}=\frac{6}{5}=1\frac{1}{5}$

240. (d) $\frac{24\sqrt{45}-16\sqrt{20}+\sqrt{245}-47\sqrt{5}}{3\frac{1}{5}+1\frac{2}{5}-2\frac{1}{6}-2\frac{1}{5}-5\frac{2}{5}+3\frac{1}{6}}$

$=\frac{72\sqrt{5}-32\sqrt{5}+7\sqrt{5}-47\sqrt{5}}{\frac{16}{5}+\frac{7}{5}-\frac{13}{6}-\frac{11}{5}-\frac{27}{5}+\frac{19}{6}}$

$=\frac{0}{\frac{16}{5}+\frac{7}{5}-\frac{13}{6}-\frac{11}{5}-\frac{27}{5}+\frac{15}{6}}=0$

241. (c) $\sqrt{a^{-1}b}\times\sqrt{b^{-1}c}\times\sqrt{c^{-1}a}$

$=\sqrt{\frac{b}{a}}\times\sqrt{\frac{c}{b}}\times\sqrt{\frac{a}{c}}$

$=\sqrt{\frac{b}{a}\times\frac{c}{b}\times\frac{a}{c}}=1$

242. (a) $\sqrt{1+\frac{\sqrt{3}}{2}}-\sqrt{1-\frac{\sqrt{3}}{2}}=C$

$\Rightarrow\sqrt{\left(\frac{2+\sqrt{3}}{2}\right)\times\frac{2}{2}}-\sqrt{\left(\frac{2-\sqrt{3}}{2}\right)\times\frac{2}{2}}=C$

$\Rightarrow\sqrt{\frac{4+2\sqrt{3}}{4}}-\sqrt{\frac{4-2\sqrt{3}}{4}}=C$

$\Rightarrow\frac{\sqrt{3}+1}{2}-\frac{\sqrt{3}-1}{2}=C$

$\Rightarrow1=C$

243. (a) Given,

$\frac{\sqrt[3]{6859}}{\sqrt[4]{1296}}\times\frac{3}{57}\times42$

$=\frac{19}{6}\times\frac{3}{57}\times42=7$

244. (d) $\sqrt{201}-\sqrt{199}=\frac{2}{\sqrt{201}+\sqrt{199}}$

$\sqrt{101}-\sqrt{99}=\frac{2}{\sqrt{101}+\sqrt{99}}$

$\sqrt{301}-\sqrt{299}=\frac{2}{\sqrt{301}+\sqrt{299}}$

$\sqrt{401}-\sqrt{399}=\frac{2}{\sqrt{401}+\sqrt{399}}$

The smallest value is $\sqrt{401}-\sqrt{399}$

In the given numbers, the numerator is same for all. So the number will be the smallest whose denominator value is the largest.

SMART APPROACH:-

If the difference between the number is same then the difference of larger number will give the smallest value. $\sqrt{401}-\sqrt{399}$ gives the smallest value

245. (b) $\sqrt[3]{6}$, $\sqrt[2]{5}$, $\sqrt[6]{12}$

LCM of 3, 2, 6 = 6

$(6)^{\frac{1}{3}}=6^{\frac{1}{3}\times6}=6^2=36$

$(5)^{\frac{1}{2}}=5^{\frac{1}{2}\times6}=5^3=125$

$(12)^{\frac{1}{6}}=12^{\frac{1}{6}\times6}=12^1=12$

$\sqrt[2]{5}$ is largest among all.

246. (b) $\sqrt{0.09}=0.3$,

$\sqrt[3]{0.064}=0.4$,

$0.5=0.5$,

$\frac{3}{5}=0.6$

$\frac{3}{5}$ is greatest among all

247. (c) $\underbrace{\sqrt{11}+\sqrt{5}}_{\text{Sum}=16}$ $\underbrace{\sqrt{14}+\sqrt{2}}_{\text{Sum}=16}$ $\underbrace{\sqrt{8}+\sqrt{8}}_{\text{Sum}=16}$

When the sum is same then largest value of multiplication gives the largest number.

$\sqrt{8}+\sqrt{8}$ is largest among all.

248. (b) $(\sqrt[3]{12}=12)^{\frac{1}{3}}$

From options:-

(a) $(60)^{\frac{1}{5}}$

LCM (3, 5) = 15

$\Rightarrow(12)^{\frac{1}{3}\times15}=12^5=248832$

$(60)^{\frac{1}{5}\times15}=60^3=216000$

$\Rightarrow(12)^{\frac{1}{3}}>(60)^{\frac{1}{5}}$

(b) $(33214)^{\frac{1}{12}}=\left[(33214)^{\frac{1}{3}}\right]^{\frac{1}{4}}$

$=\left[(33214)^{\frac{1}{4}}\right]^{\frac{1}{3}}\Rightarrow(13.5)^{\frac{1}{3}}>12^{\frac{1}{3}}$

249. (b) $\sqrt{a\sqrt{a\sqrt{a\sqrt{a}}}}$

n = count square root = 4

$\Rightarrow a^{\frac{2^n-1}{2^n}}=a^{\frac{2^4-1}{2^4}}=a^{\frac{15}{16}}$

250. (d) $\sqrt{30+\sqrt{30+\sqrt{30+\sqrt{30+\ldots\infty}}}}$

6 × 5

In such questions, factorise the number in gap of 1. Higher value will be the answer.

6 is the right answer.

251. (b) $\left(\sqrt{72-\sqrt{72-\sqrt{72-\sqrt{72-\ldots\infty}}}}\right)\div$

9 × 8

$\left(\sqrt{20-\sqrt{20-\sqrt{20-\ldots\infty}}}\right)$

5 × 4

In such questions, factorise the number in gap of 1. Smaller value will be the answer.

$\Rightarrow 8\div4=2$

252. (a) $\sqrt{5+\sqrt{5+\sqrt{5+\ldots\infty}}}$

$x=\frac{\sqrt{1+4a}+1}{2}=\frac{\sqrt{1+4\times5}+1}{2}$

$=\frac{\sqrt{21}+1}{2}$

253. (a) $\sqrt{19-\sqrt{19-\sqrt{19-\sqrt{19-\ldots\infty}}}}$

$x=\frac{\sqrt{1+4a}-1}{2}=\frac{\sqrt{1+4\times19}-1}{2}$

$=\frac{\sqrt{77}-1}{2}$

254. (d)

$$P = \sqrt{11+3\sqrt{11+3\sqrt{11+3\sqrt{11-....\infty}}}}$$

$$P = \frac{\sqrt{4a+b^2}+b}{2}$$

$$= \frac{\sqrt{4\times11+3^2}+3}{2} = \frac{\sqrt{44+9}+3}{2}$$

$$= \frac{\sqrt{53}+3}{2}$$

$$Q = \sqrt{11-3\sqrt{11-3\sqrt{11-3\sqrt{11-....\infty}}}}$$

$$Q = \frac{\sqrt{4a+b^2}-b}{2}$$

$$= \frac{\sqrt{4\times11+3^2}-3}{2} = \frac{\sqrt{44+9}-3}{2}$$

$$= \frac{\sqrt{53}-3}{2}$$

$$\therefore P + Q = \frac{\sqrt{53}+3}{2} + \frac{\sqrt{53}-3}{2} = \sqrt{53}$$

Alternate Method:

$P - Q = b = 3$

$PQ = a = 11$

$\because (P + Q)^2 = (P - Q)^2 + 4PQ$

$\Rightarrow (P + Q)^2 = (3)^2 + 4 \times 11$

$\Rightarrow (P + Q)^2 = 9 + 44$

$\Rightarrow P + Q = \sqrt{53}$

255. (d) $\sqrt{7+2\sqrt{7-2\sqrt{7+2\sqrt{7-2\sqrt{7+....}}}}}$

$$x = \frac{\sqrt{4a-3b^2}+b}{2}$$

$$= \frac{\sqrt{4\times7-3\times2^2}+2}{2} = \frac{\sqrt{28-12}+2}{2}$$

$$= \frac{4+2}{2} = 3$$

256. (c) $x = \sqrt{6-\sqrt{6+\sqrt{6-\sqrt{6+....\infty}}}}$

$$x = \frac{\sqrt{4a-3b^2}-b}{2}$$

Here a = 6, b = 1

$$x = \frac{\sqrt{4\times6-3}-1}{2} = \frac{\sqrt{21}-1}{2}$$

257. (c) $\frac{\sqrt{1.24}\times\sqrt{2.79}}{\sqrt{2.64}\times\sqrt{5.94}}$

After simplifying decimal

$$= \frac{\sqrt{124}\times\sqrt{279}}{\sqrt{264}\times\sqrt{594}} = \frac{2\times\sqrt{31}\times3\sqrt{31}}{2\sqrt{66}\times3\sqrt{66}}$$

$$= \sqrt{\frac{31\times31}{66\times66}} = \frac{31}{66}$$

258. (b) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$$= \frac{(\sqrt{3}+\sqrt{2})^2}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})} = \frac{3+2+2\sqrt{6}}{1}$$

$= 5 + 2 \times 2.45 = 5 + 4.90 = 9.9$

259. (b)

$$\frac{\sqrt{29.16}}{\sqrt{1.1664}} + \frac{\sqrt{0.2916}}{\sqrt{116.64}} + \frac{\sqrt{0.0036}}{\sqrt{0.36}}$$

$\because \sqrt{2916} = 54, \sqrt{11664} = 108$

$$= \frac{5.4}{1.08} + \frac{0.54}{10.8} + \frac{0.06}{0.6}$$

$$= 5 + \frac{1}{20} + \frac{1}{10} = \frac{103}{20}$$

260. (a) $\frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}} \times \frac{\sqrt{14}-\sqrt{10}}{\sqrt{14}+\sqrt{10}} + \frac{\sqrt{10}}{\sqrt{5}}$

$$= \frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}} \times \frac{\sqrt{2}(\sqrt{7}-\sqrt{5})}{\sqrt{2}(\sqrt{7}+\sqrt{5})} + \frac{\sqrt{10}}{\sqrt{5}}$$

$= 1 + \sqrt{2}$

261. (a) $\sqrt{\frac{\sqrt{5}-1}{\sqrt{5}+1}} = \sqrt{\frac{(\sqrt{5}-1)(\sqrt{5}-1)}{(\sqrt{5}+1)(\sqrt{5}-1)}}$

$$= \sqrt{\frac{(\sqrt{5}-1)^2}{4}} = \frac{(\sqrt{5}-1)}{2} = \frac{2.24-1}{2}$$

$$= \frac{1.24}{2} = 0.62$$

262. (a) $A = \frac{\sqrt{0.0004}\times\sqrt[3]{0.000008}}{\sqrt[4]{16000}\times\sqrt[3]{125000}\times\sqrt[4]{810}}$

$$= \frac{0.02\times0.02}{\sqrt[4]{16000\times810}\times\sqrt[3]{125000}}$$

$$= \frac{0.02\times0.02}{\sqrt[4]{16\times10^4\times81}\times\sqrt[3]{125\times10^3}}$$

$$= \frac{0.02\times0.02}{2\times3\times10\times5\times10}$$

$$= \frac{4\times10^{-4}}{3\times10^3} = \frac{4}{3}\times10^{-7}$$

$$B = \sqrt[3]{0.729}\times\frac{\sqrt[4]{.0016}}{0.16}$$

$$= \frac{0.9\times0.2}{0.4} = \frac{9}{20}$$

$$\therefore A \times B = \frac{4}{3} \times 10^{-7} \times \frac{9}{20}$$

$$= \frac{3}{5}\times10^{-7} = 6\times10^{-8}$$

263. (c) $\frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{3+\sqrt{5}}} = a+\sqrt{5}\,b$

$$\Rightarrow \frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{3+\sqrt{5}}} \times \frac{\sqrt{2}}{\sqrt{2}} = a+\sqrt{5}\,b$$

$$\Rightarrow \frac{44}{8-\sqrt{\sqrt{6}+2\sqrt{5}}} = a+\sqrt{5}b$$

$$\Rightarrow \frac{44}{8-(\sqrt{5}+1)} = a+\sqrt{5}b$$

$$\Rightarrow \frac{44}{7-\sqrt{5}} = a+\sqrt{5}b$$

$$\Rightarrow \frac{44}{7-\sqrt{5}} \times \frac{7+\sqrt{5}}{7+\sqrt{5}} = a+\sqrt{5}b$$

$\Rightarrow 7+\sqrt{5} = a+\sqrt{5}b$

$\Rightarrow$ a = 7 and b = 1

$\therefore$ ab : (a + b) = 7 : 8

264. (c) $\frac{1}{\sqrt{16}-\sqrt{15}} - \frac{1}{\sqrt{15}-\sqrt{14}} + \frac{1}{\sqrt{14}-\sqrt{13}}$

$$-\frac{1}{\sqrt{13}-\sqrt{12}} + \frac{1}{\sqrt{12}-\sqrt{11}}$$

$$-\frac{1}{\sqrt{11}-\sqrt{10}} + \frac{1}{\sqrt{10}-3} - \frac{1}{3-\sqrt{8}}$$

$$= 4+\sqrt{15}-\left(\sqrt{15}+\sqrt{14}\right)+\sqrt{14}+\sqrt{13}$$

$$-\left(\sqrt{13}+\sqrt{12}\right)+\sqrt{12}+\sqrt{11}-(\sqrt{11}+\sqrt{10})$$

$$+\sqrt{10}+3-\left(3+\sqrt{8}\right) = 4-\sqrt{8}$$

$$= 4 - 2\sqrt{2}$$

265. (b) $\frac{8\sqrt{5}}{\sqrt{10}-\sqrt{2}} - \frac{5\sqrt{2}}{\sqrt{10}-\sqrt{5}} - \frac{3\sqrt{10}}{\sqrt{2}-\sqrt{5}}$

$$+\frac{1}{2-\sqrt{2}} = a + b\sqrt{2}$$

$$\Rightarrow \frac{8\sqrt{5}(\sqrt{10}+\sqrt{2})}{8} - \left(\frac{5\sqrt{2}(\sqrt{10}+\sqrt{5})}{5}\right)$$

$$-\left(\frac{3\sqrt{10}(\sqrt{2}+\sqrt{5})}{(-3)}\right) + \frac{2+\sqrt{2}}{2} = a + b\sqrt{2}$$

$$\Rightarrow \sqrt{50} + \sqrt{10} - \sqrt{20} - \sqrt{10}$$

$$+\sqrt{20}+\sqrt{50}+1+\frac{1}{\sqrt{2}} = a + b\sqrt{2}$$

$$\Rightarrow 2\sqrt{50} + 1 + \frac{1}{\sqrt{2}} = a + b\sqrt{2}$$

$$\Rightarrow 10\sqrt{2} + 1 + \frac{1}{\sqrt{2}} = a + b\sqrt{2}$$

$$\Rightarrow \frac{20+\sqrt{2}+1}{\sqrt{2}} = a + b\sqrt{2}$$

$$\Rightarrow \frac{21}{\sqrt{2}} + 1 = a + b\sqrt{2}$$

$$\Rightarrow \frac{21\sqrt{2}}{2} + 1 = a + b\sqrt{2}$$

$$\Rightarrow a = 1, b = \frac{21}{2}$$

$$\therefore 15a - 2b = 15 \times 1 - 2 \times \frac{21}{2}$$

$= 15 - 21 = -6$

266. (a) $\frac{\left(\sqrt{26-7\sqrt{3}}\right)}{\left(\sqrt{14+5\sqrt{3}}\right)} = \frac{b+a\sqrt{3}}{11}$

$$\Rightarrow \frac{\sqrt{26-7\sqrt{3}}}{\sqrt{14+5\sqrt{3}}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{b+a\sqrt{3}}{11}$$

$$\Rightarrow \frac{\sqrt{52-2\times7\sqrt{3}}}{\sqrt{28+2\times5\sqrt{3}}} = \frac{b+a\sqrt{3}}{11}$$

$$\Rightarrow \frac{7-\sqrt{3}}{5+\sqrt{3}} = \frac{b+a\sqrt{3}}{11}$$

$$\Rightarrow \frac{(7-\sqrt{3})\times(5-\sqrt{3})}{(5+\sqrt{3})\times(5-\sqrt{3})} = \frac{b+a\sqrt{3}}{11}$$

$$\Rightarrow \frac{38-12\sqrt{3}}{22} = \frac{b+a\sqrt{3}}{11}$$

$\Rightarrow 19-6\sqrt{3} = b+a\sqrt{3}$

Comparing both side

$\Rightarrow$ a = – 6, b = 19

$\therefore \sqrt{b-a} = \sqrt{19-(-6)} = \sqrt{25} = 5$

267. (a) $9^{18} \div 3^{14}$ of $27^3 \times \sqrt{6561}$

$= 3^{36} \div 3^{14}$ of $3^9 \times 3^4$

$= 3^{36} \div 3^{23} \times 3^4$

$= 3^{13} \times 3^4$

$= 3^{17}$

268. (c) $\left(\sqrt[3]{\sqrt[3]{343}}\right)^3 \times \left(\sqrt[3]{\sqrt[3]{216}}\right)^3$

$$= (343)^{3\times\frac{1}{3}\times\frac{1}{3}} \times (216)^{3\times\frac{1}{3}\times\frac{1}{3}}$$

$$= (7^3)^{\frac{1}{3}} \times (6^3)^{\frac{1}{3}} = 7 \times 6 = 42$$

269. (a) $(0.3)^{\left[\left|\frac{(200-146)}{(3\times3\times3)}\right|-3\right]}$

$$= 0.3^{(2-3)} = (0.3)^{-1} = \frac{1}{0.3} = \frac{10}{3}$$

21
Chapter

ALGEBRA

• TYPE – I •
INVERSE FUNCTION (BASIC QUESTIONS)

1. If $a + \frac{1}{a} = 12$, then find the value of $a^2 + \frac{1}{a^2}$.

SSC CGL 10/09/2024 (Shift-01)

(a) 144 (b) 146
(c) 142 (d) 140

2. If $\left(y + \frac{1}{y}\right) = 8$, find the value of $\left(y^2 + \frac{1}{y^2}\right)$.

SSC CHSL 03/08/2023 (Shift-03)

(a) 62 (b) 66
(c) 64 (d) 60

3. If $x + \frac{1}{x} = 15$, then the value of $\left(x^2 + \frac{1}{x^2}\right)$ is:

SSC Phase-XII 26/06/2024 (Shift-03)

(a) 223 (b) 225
(c) 13 (d) 17

4. If $x + \frac{1}{x} = 7$, then the value of $x^2 + \frac{1}{x^2}$ is:

SSC CHSL 02/08/2023 (Shift-01)

(a) 49 (b) 51
(c) 47 (d) 5

5. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 7$, then the value of $x + \frac{1}{x}$ is equal to:

SSC CGL 10/09/2024 (Shift-02)

(a) 47 (b) 49
(c) 51 (d) 45

6. If $\left(a + \frac{1}{a}\right) = 6$, then what is the value of $\frac{3}{4}\left(a^2 + \frac{1}{a^2}\right)$?

SSC CHSL 02/08/2023 (Shift-02)

(a) 22.5 (b) 34
(c) 25.5 (d) 36

7. If $\left(z + \frac{1}{z}\right) = 4$, then what will be the value of $\frac{1}{2}\left(z^2 + \frac{1}{z^2}\right)$?

SSC CHSL 03/08/2023 (Shift-02)

(a) 14 (b) 16
(c) 7 (d) 8

8. If $\left(3y + \frac{3}{y}\right) = 8$, find the value of $\left(y^2 + \frac{1}{y^2}\right)$.

SSC CHSL 11/08/2023 (Shift-01)

(a) $5\frac{1}{9}$ (b) $4\frac{5}{6}$
(c) $7\frac{1}{9}$ (d) $9\frac{1}{9}$

9. If $\left(5y + \frac{5}{y}\right) = 11$, find the value of $\left(y^2 + \frac{1}{y^2}\right)$.

SSC CGL 20/07/2023 (Shift-02)

(a) $2\frac{21}{25}$ (b) $1\frac{21}{25}$
(c) $3\frac{21}{25}$ (d) $4\frac{21}{25}$

10. If $\frac{1}{(x-2)} + x = 8$, then what is the value of $\frac{1}{(x-2)^2} + (x-2)^2$?

SSC CHSL 17/03/2023 (Shift-04)

(a) 38 (b) 36
(c) 40 (d) 34

11. If $a + \frac{1}{a} = 3$, then the value of $a^4 + \frac{1}{a^4}$ is:

SSC CPO 04/10/2023 (Shift-01)

(a) 27 (b) 81
(c) 48 (d) 47

12. If $a + \frac{1}{a} = 8$, then what is the value if $\frac{1}{a^4} + a^4$?

SSC CHSL 14/03/2023 (Shift-04)

(a) 4098 (b) 3846
(c) 3842 (d) 4094

13. If $a + \frac{1}{a} = 4$, then what is the value of $a^4 + \frac{1}{a^4}$?

SSC CHSL 21/03/2023 (Shift-03)

(a) 206 (b) 194
(c) 204 (d) 198

14. If $x + \frac{1}{x} = 13$, what is the value of $x^4 + \frac{1}{x^4}$?

SSC CHSL 25/05/2022 (Shift-02)

(a) 27887 (b) 27891
(c) 29243 (d) 28561

15. If $\left(x + \frac{1}{x}\right) = 5\sqrt{2}$, then what is the value of $(x^4 + x^{-4})$?

SSC CGL 01/12/2022 (Shift-02)

(a) 2542 (b) 2650
(c) 2452 (d) 2302

16. If $\frac{x^2+1}{x} = 5$, then find the value of $x^4 + \frac{1}{x^4} - 36$.

SSC CHSL 09/08/2023 (Shift-02)

(a) 491 (b) 149
(c) 419 (d) 194

17. If $X + \frac{1}{X} = 2K$, then what is the value of $X^4 + \frac{1}{X^4}$?

SSC CHSL 16/03/2023 (Shift-04)

(a) $16K^4 - 16K^2 - 1$
(b) $8K^4 + 4K^2 - 1$
(c) $16K^4 - 16K^2 + 2$
(d) $6K^4 - 4K^2 - 1$

18. If $x + \frac{1}{x} = 7$, find the value of $x^3 + \frac{1}{x^3}$.

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 343 (b) 332
(c) 340 (d) 322

19. If $x + \frac{1}{x} = 7$, then the value of $x^6 + \frac{1}{x^6}$ is:

SSC CGL 14/07/2023 (Shift-03)

(a) 113682
(b) 103682
(c) 103882
(d) 103862

20. If $y + \frac{1}{y} = \sqrt{5}$, then the value of $y^6 + \frac{1}{y^6}$ is:

SSC Phase-X 05/08/2022 (Shift-03)

(a) 18 (b) 12
(c) 10 (d) 15

21. If $\left(x + \frac{1}{x}\right) = 2\sqrt{2}$, what is the value of $\left(x^6 + \frac{1}{x^6}\right)$?

SSC CGL 24/07/2023 (Shift-02)

(a) 198 (b) 216
(c) 180 (d) 234

22. If $\left(a+\frac{1}{a}\right)=7\sqrt{3}$, then what is the value of $(a^6 + a^{-6})$?

SSC CGL 19/09/2024 (Shift-01)

(a) 3048190 (b) 3048542
(c) 3048132 (d) 3048625

23. If $\sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{6}$, then the value of $x^6+\frac{1}{x^6}$ will be:

SSC CHSL 04/08/2021 (Shift-02)

(a) 2712 (b) 2502
(c) 2270 (d) 2702

24. If $a+\frac{1}{a}=7$, then $a^5+\frac{1}{a^5}$ is equal to:

SSC CGL 17/07/2023 (Shift-02)

(a) 15127 (b) 13127
(c) 14527 (d) 11512

25. If $(x+\frac{1}{x})=5$, then the value of $(x^5+\frac{1}{x^5})$ is:

SSC CHSL 07/08/2023 (Shift-02)

(a) 2535 (b) 2540
(c) 2515 (d) 2525

26. If $x+\frac{1}{x}=-6$, what will be the value of $x^5+\frac{1}{x^5}$

SSC CGL 17/07/2023 (Shift-03)

(a) –7776 (b) –6726
(c) –6730 (d) –6732

27. If $x+\frac{1}{x}=-2\sqrt{3}$, what is the value of $x^5+\frac{1}{x^5}$?

SSC CHSL 24/05/2022 (Shift-03)

(a) $-178\sqrt{3}$ (b) $-182\sqrt{3}$
(c) $182\sqrt{3}$ (d) $-180\sqrt{3}$

28. If $x+\frac{1}{x}=3, x\neq 0$, then the value of $x^7+\frac{1}{x^7}$ is:

SSC CGL TIER-II 03/02/2022

(a) 749 (b) 843
(c) 746 (d) 849

29. If $x+\frac{1}{x}=6$, then find the value of $\frac{3x}{2x^2-5x+2}$.

SSC CGL 13/12/2022 (Shift-01)

(a) 1 (b) $\frac{3}{7}$
(c) $\frac{2}{3}$ (d) 0

30. If $x+\frac{1}{x}=15$, then the value of $\frac{7x^2-9x+7}{x^2-x+1}$ is:

SSC CGL 12/09/2024 (Shift-01)

(a) $-\frac{48}{7}$ (b) $-\frac{22}{7}$
(c) $\frac{48}{7}$ (d) $\frac{22}{7}$

31. If $(x-\frac{1}{x})=0.4$, and $x>0$, what is the value of $(x^2+\frac{1}{x^2})$?

SSC CHSL 07/08/2023 (Shift-02)

(a) 4.16 (b) 3.32
(c) 1.84 (d) 2.16

32. If $\left(4y-\frac{4}{y}\right)=11$, find the value of $\left(y^2+\frac{1}{y^2}\right)$.

SSC CHSL 08/08/2023 (Shift-04)

(a) $7\frac{9}{16}$ (b) $5\frac{9}{16}$
(c) $9\frac{11}{16}$ (d) $9\frac{9}{16}$

33. If $\left(3y-\frac{3}{y}\right)=5$, find the value of $\left(y^2+\frac{1}{y^2}\right)$.

SSC CGL 19/07/2023 (Shift-02)

(a) $\frac{47}{9}$ (b) $\frac{49}{9}$
(c) $\frac{41}{9}$ (d) $\frac{43}{9}$

34. If $5x-\frac{5}{x}+6=0$, then $x^2+\frac{1}{x^2}$ is:

SSC CGL 12/12/2022 (Shift-01)

(a) $\frac{86}{25}$ (b) $\frac{43}{12}$
(c) $\frac{81}{10}$ (d) $\frac{86}{11}$

35. If $\left(x-\frac{1}{x-1}\right)=3$, then the value of $(x-1)^2+\frac{1}{(x-1)^2}$ is:

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 6 (b) 4
(c) 3 (d) 5

36. Let $3t-\frac{1}{3t}=3$, then which of the following expression has the value equal to 12?

SSC CGL 23/09/2024 (Shift-03)

(a) $9t^2+\frac{1}{9t^2}+2$
(b) $9t^2+\frac{1}{9t^2}-2$
(c) $9t^2+\frac{1}{9t^2}+1$
(d) $9t^2+\frac{1}{9t^2}$

37. If $\sqrt{x}-\frac{1}{\sqrt{x}}=4$, then $x^2+\frac{1}{x^2}$ is equal to :

SSC CGL 10/06/2019 (Shift-01)

(a) 192 (b) 326
(c) 322 (d) 256

38. If $x\left(5-\frac{2}{x}\right)=\frac{5}{x}$, then the value of $x^2+\frac{1}{x^2}$ is:

SSC CPO 03/10/2023 (Shift-03)

(a) $\frac{54}{23}$ (b) $\frac{53}{28}$
(c) $\frac{53}{27}$ (d) $\frac{54}{25}$

39. If $p-\frac{1}{p}=6$, the what is the value of $p^4+\frac{1}{p^4}$?

SSC CGL 09/12/2022 (Shift-03)

(a) 1562 (b) 1432
(c) 1442 (d) 1444

40. If $x-\frac{1}{x}=13$, what will be the value of $x^4+\frac{1}{x^4}$?

SSC CGL 03/12/2022 (Shift-01)

(a) 28561 (b) 29243
(c) 27887 (d) 29239

41. $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{3}$, then what is the value of $x^4+\frac{1}{x^4}$

SSC CGL 18/04/2022 (Shift-03)

(a) 7 (b) 527
(c) 531 (d) 623

42. If $x-\frac{1}{x}=1$, then what is the value of $x^8+\frac{1}{x^8}$?

SSC CGL 13/08/2021 (Shift-03)

(a) 3 (b) 119
(c) 47 (d) –1

43. If $\left(y-\frac{1}{y}\right)=9$ then what is the value of $\left(y^3-\frac{1}{y^3}\right)$ is:

SSC CHSL 04/08/2023 (Shift-03)

(a) 729 (b) 756
(c) 702 (d) 766

44. If $\left(x-\frac{1}{x}\right)=\frac{7}{3}$, what is the value of $\left(x^3-\frac{1}{x^3}\right)$?

SSC CHSL 26/05/2022 (Shift-02)

(a) $19\frac{20}{27}$ (b) $19\frac{19}{27}$
(c) $19\frac{7}{9}$ (d) $19\frac{2}{3}$

45. If $7a-\frac{7}{a}+4=0$, then find $a^3-\frac{1}{a^3}-1$.

SSC CGL 25/07/2023 (Shift-02)

(a) $\frac{-995}{343}$ (b) $\frac{-875}{248}$
(c) $\frac{-694}{315}$ (d) $\frac{-765}{262}$

46. If $\left(x-\frac{1}{x-2}\right)=7$, then the value of $(x-2)^3-\frac{1}{(x-2)^3}$ is:

SSC CHSL 07/08/2023 (Shift-04)

(a) 130 (b) 115
(c) 140 (d) 125

47. If $s-\frac{1}{s-8}=20$, then the value of $(s-8)^3-\frac{1}{(s-8)^3}$ is:

SSC CPO 11/11/2022 (Shift-03)

(a) 1324 (b) 1764
(c) 1864 (d) 1944

48. If $\frac{x^2-1}{x}=8$, then what is the value of $\frac{x^6-1}{x^3}$?

SSC CHSL 14/03/2023 (Shift-02)

(a) 496 (b) 536
(c) 512 (d) 488

49. If $\left(y-\frac{1}{y}\right)=4$, find the value of $\left(y^6+\frac{1}{y^6}\right)$.

SSC CGL 25/07/2023 (Shift-01)

(a) 5774 (b) 4096
(c) 5776 (d) 5778

50. If $\left(x-\frac{1}{x}=4\right)$, then what is the value of $\left(x^6+\frac{1}{x^6}\right)$?

SSC CHSL 21/03/2023 (Shift-04)

(a) 4689 (b) 4786
(c) 5832 (d) 5778

51. If $\left(x-\frac{1}{x}\right)=2\sqrt{2}$ what is the value of $\left(x^6+\frac{1}{x^6}\right)$?

SSC CGL 21/07/2023 (Shift-02)

(a) 1030 (b) 960
(c) 1000 (d) 970

◆ TYPE – II ◆
INVERSE FUNCTION (QUADRATIC EQUATION)

52. If $\frac{2p}{p^2-5p+1}=\frac{1}{10}$, $p\neq 0$, then the value of $\left(p+\frac{1}{p}\right)$ is:

SSC CGL 08/12/2022 (Shift-02)

(a) 10 (b) 25
(c) 1 (d) 15

53. If $\frac{8r}{r^2-8r+1}=\frac{1}{14}$, then the value of $\left(r+\frac{1}{r}\right)$ is ________.

SSC CHSL 26/05/2022 (Shift-01)

(a) 88 (b) 100
(c) 120 (d) 60

54. If $x+\frac{2}{x}=1$, then the value of $\frac{x^2+7x+2}{x^2+13x+2}$ is:

SSC CHSL 04/08/2023 (Shift-02)

(a) $\frac{5}{7}$ (b) $\frac{3}{7}$
(c) $\frac{4}{7}$ (d) $\frac{2}{7}$

55. If $b^2-4b-1=0$, then find the value of $b^2+\frac{1}{b^2}+3b-\frac{3}{b}$

SSC CHSL 27/05/2022 (Shift-03)

(a) 32 (b) 30
(c) 18 (d) 24

56. If $x+\frac{1}{x}=5$, $x\neq 0$ then the value of $\frac{x^4+\frac{1}{x^2}}{x^2-3x+1}$ is equal to :

SSC CHSL 20/10/2020 (Shift- 01)

(a) 50 (b) 60
(c) 65 (d) 55

57. If $x^2-3x+1=0$, then the value of $\frac{x^4+\frac{1}{x^2}}{x^2+5x+1}$ is:

SSC CGL TIER-II 03/02/2022

(a) $\frac{9}{4}$ (b) $\frac{27}{8}$
(c) $\frac{5}{2}$ (d) 2

58. If $a^2-4a+1=0$, then the value of $a^2+a+\frac{1}{a}+\frac{1}{a^2}$ is:

SSC CHSL 26/05/2022 (Shift-02)

(a) 10 (b) 1
(c) 18 (d) 16

59. If $x^2-3x+1=0$, then the value of $\left(x^5+\frac{1}{x^3}\right)\div(x^2+1)$ is:

CPO 2019 24/11/2020 (Shift-01)

(a) 9 (b) $\frac{47}{3}$
(c) 7 (d) 5

60. If $x^2-3x-1=0$, then the value of $(x^2+8x-1)(x^3+x^{-1})^{-1}$ is:

SSC CGL 07/06/2019 (Shift-02)

(a) $\frac{3}{8}$ (b) 8
(c) 1 (d) 3

61. If $x^2-4x-1=0$, then find the value of $x^2+\frac{1}{x^2}-5$.

SSC CHSL 09/08/2023 (Shift-01)

(a) 17 (b) 12
(c) 15 (d) 13

62. If $x^2-6x-1=0$, then find the value of $x^2+\frac{1}{x^2}-8$.

SSC CPO 29/06/2024 (Shift-03)

(a) 30 (b) 32
(c) 28 (d) 34

63. If $p^2-4p-1=0$, then the value of $p^2+3p+\frac{1}{p^2}-\frac{3}{p}$ is:

SSC CHSL 17/08/2023 (Shift-02)

(a) 40 (b) 50
(c) 65 (d) 30

64. If $x-\frac{1}{x}=5$, $x\neq 0$, then what is the value of $\frac{x^6+3x^3-1}{x^6-8x^3-1}$?

CGL 2019 TIER-II 16/11/2020

(a) $\frac{13}{12}$ (b) $\frac{11}{13}$
(c) $\frac{3}{8}$ (d) $\frac{4}{9}$

65. If, for a non-zero x, $5x^2+7x+5=0$, then the value of $x^3+\frac{1}{x^3}$ is:

SSC CGL 06/12/2022 (Shift-04)

(a) $\frac{496}{125}$ (b) $\frac{532}{343}$
(c) $\frac{125}{532}$ (d) $\frac{182}{125}$

66. If for a non-zero x, $7x^2+5x+7=0$, then the $x^3+\frac{1}{x^3}$ is ____.

SSC Phase-XII 24/06/2024 (Shift-02)

(a) $\frac{420}{343}$ (b) $\frac{610}{420}$
(c) $\frac{610}{343}$ (d) $\frac{343}{610}$

67. If $\frac{x}{x^2-2x+1}=\frac{1}{3}$, then the value of $x^3+\frac{1}{x^3}$ is:

SSC CGL 26/09/2024 (Shift-03)

(a) 110 (b) 130
(c) 160 (d) 180

68. If $2x+\frac{2}{x}=5$, then the value of $\left(x^3+\frac{1}{x^3}+2\right)$ will be:

SSC CHSL 02/08/2023 (Shift-01)

(a) $\frac{81}{11}$ (b) $\frac{81}{7}$
(c) $\frac{71}{8}$ (d) $\frac{81}{8}$

69. If $K+\frac{1}{K}=-3$, then what is the value of $\left(\frac{k^6+1}{K^3}\right)+\left(\frac{k^4+1}{K^2}\right)$?

SSC CHSL 15/03/2023 (Shift-04)

(a) 27 (b) −11
(c) 29 (d) 27

70. If $\frac{K}{K^2-2K+1}=\frac{1}{6}$, then what is the value of $\frac{1}{K^3}+K^3$?

SSC CHSL 21/03/2023 (Shift-02)

(a) 472 (b) 492
(c) 512 (d) 488

71. If $x^2-5x+1=0$, then the value of $\frac{x^6+x^4+x^2+1}{5x^3}=$?

SSC CGL 01/12/2022 (Shift-01)

(a) 30 (b) 25
(c) 23 (d) 28

72. If $4x^2-6x+1=0$, then the value of $8x^3+(8x^3)^{-1}$ is:

SSC CGL 10/06/2019 (Shift-01)

(a) 36 (b) 13
(c) 18 (d) 11

73. If $x^2-\sqrt{7}x+1=0$, then what is the value of $x^5+\frac{1}{x^5}$?

SSC CGL TIER-II 29/01/2022

(a) $19\sqrt{7}$ (b) $27\sqrt{7}$
(c) $21\sqrt{7}$ (d) $25\sqrt{7}$

74. If $x^2 + 3x + 1 = 0$, then what is the value of $x^6 + \frac{1}{x^6}$?

SSC CGL 03/03/2020 (Shift-02)

(a) 324 (b) 322
(c) 318 (d) 327

75. If $x^2 - 3x + 1 = 0$, then the value of $2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right)$ is:

SSC CHSL 12/04/2021 (Shift-03)

(a) 4379 (b) 4279
(c) 3479 (d) 4370

◆ TYPE – III ◆
INVERSE FUNCTION (REVERSE CASE)

76. If $x^2 + \frac{1}{x^2} = 119$ $(x > 0)$, then the value of $\left(x^3 + \frac{1}{x^3}\right)$ is:

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 1298 (b) 1125
(c) 1920 (d) 1331

77. If $x^2 + \frac{1}{x^2} = 7$, then what is the value of $x^3 + \frac{1}{x^3}$?

SSC CHSL 13/03/2023 (Shift-02)

(a) 9 (b) 18
(c) 27 (d) 36

78. If $\left(p^2 + \frac{1}{p^2} = 14\right)$, then find the value of $\left(p^3 + \frac{1}{p^3}\right)$.

SSC CHSL 17/03/2023 (Shift-02)

(a) 56 (b) 60
(c) 48 (d) 52

79. If $x^2 + \frac{1}{x^2} = 7$, then the value of $x^3 + \frac{1}{x^3}$ where $x > 0$ is equal to :

CGL 2019 TIER-II 18/11/2020

(a) 15 (b) 16
(c) 12 (d) 18

80. If $\frac{x^2}{y^2} + \frac{y^2}{x^2} = 7$, A possible value of $\frac{x^3}{y^3} + \frac{y^3}{x^3}$ is:

SSC CHSL 26/05/2022 (Shift-01)

(a) 18 (b) 15
(c) 16 (d) 17

81. If $x^4 + x^{-4} = 7$, $x > 0$, then what is the value of $x^2 + \frac{1}{x^2} - 2$?

SSC CPO 09/11/2022 (Shift-01)

(a) 1 (b) 0
(c) 5 (d) 3

82. If $16x^4 + \frac{1}{16x^4} = 14159$, then find the value of $2x + \frac{1}{2x}$.

SSC CPO 27/06/2024 (Shift-03)

(a) 9 (b) 11
(c) 12 (d) 15

83. If $x^4 + \frac{1}{x^4} = 194$, $x > 0$, then find the value of $x^3 + \frac{1}{x^3} + x + \frac{1}{x}$.

SSC CHSL 08/08/2023 (Shift-03)

(a) 76 (b) 66
(c) 56 (d) 46

84. If $x > 0$, and $x^4 + \frac{1}{x^4} = 254$, What is the value of $x^5 + \frac{1}{x^5}$?

SSC CGL 14/07/2023 (Shift-04)

(a) $717\sqrt{2}$ (b) $723\sqrt{2}$
(c) $720\sqrt{2}$ (d) $726\sqrt{2}$

85. If $x > 0$ and $x^4 + \frac{1}{x^4} = 142$, what is the value of $x^7 + \frac{1}{x^7}$?

SSC CGL 20/07/2023 (Shift-02)

(a) $1561\sqrt{14}$ (b) $1563\sqrt{14}$
(c) $1560\sqrt{14}$ (d) $1562\sqrt{14}$

86. If $k^4 + \frac{1}{k^4} = 194$, then what is the value of $k^3 + \frac{1}{k^3}$?

SSC CGL 02/12/2022 (Shift-03)

(a) 42 (b) 52
(c) 36 (d) 18

87. If $x^4 + \frac{16}{x^4} = 15617$, $x > 0$, then find the value of $x + \frac{2}{x}$.

SSC CGL 12/12/2022 (Shift-03)

(a) $\sqrt{121}$ (b) $\sqrt{129}$
(c) $\sqrt{123}$ (d) $\sqrt{127}$

88. If $x^8 - 433x^4 + 16 = 0$, $x > 0$, then what is the value of $\left(x + \frac{2}{x}\right)$

SSC CGL 17/08/2021 (Shift-02)

(a) 5 (b) 7
(c) 4 (d) 9

89. If $x^4 + \frac{1}{x^4} = 47$, then what is the value of $x^3 + \frac{1}{x^3}$?

SSC CHSL 09/03/2023 (Shift-02)

(a) 18 (b) 9
(c) 27 (d) 36

90. If $a^4 + \frac{1}{a^4} = 194$, then what is the value of $\frac{a^6 + 1}{a^3}$?

SSC CHSL 09/03/2023 (Shift-04)

(a) 46 (b) 50
(c) 52 (d) 48

91. If $x^4 + \frac{1}{x^4} = 1154$, where $x > 0$, then what is the value of $x^3 + \frac{1}{x^3}$?

SSC CPO 09/11/2022 (Shift-01)

(a) 205 (b) 214
(c) 185 (d) 198

92. If $a^4 + \frac{1}{a^4} = 50$, $a > 0$ then the value of $a^3 + \frac{1}{a^3}$.

SSC CGL 07/03/2020 (Shift-03)

(a) $\sqrt{2\left(1+\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$
(b) $\sqrt{2\left(1-\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$
(c) $\sqrt{2\left(1+\sqrt{13}\right)}\left(-1-2\sqrt{13}\right)$
(d) $\sqrt{2\left(1+\sqrt{13}\right)}+\left(-1+2\sqrt{13}\right)$

93. If $x > 0$, and $x^4 + \frac{1}{x^4} = 2207$, what is the value of $x^7 + \frac{1}{x^7}$?

SSC CGL 02/12/2022 (Shift-01)

(a) 710649 (b) 710647
(c) 710654 (d) 710661

94. If $x^8 - 34x^4 + 1 = 0$ $x > 0$, then what is the value of $x^6 + \frac{1}{x^6}$?

SSC PHASE-IX 2022

(a) 198 (b) 188
(c) 192 (d) 194

95. If $x^2 + \frac{1}{x^2} = 29$, then find the value of $x - \frac{1}{x}$.

SSC CHSL 10/08/2023 (Shift-01)

(a) ± 4 (b) $\pm 3\sqrt{3}$
(c) ± 3 (d) $\pm 4\sqrt{3}$

96. If $x^2 + \frac{1}{x^2} = 18$, and $x > 1$, what is the value of $\left(x^3 - \frac{1}{x^3}\right)$?

SSC Phase-XI 27/06/2023 (Shift-04)

(a) 52 (b) 76
(c) 80 (d) 64

97. If $x > 1$ and $x^2 + \frac{1}{x^2} = 83$ then, $x^3 - \frac{1}{x^3}$ is:

SSC CGL 17/09/2024 (Shift-01)

(a) 884 (b) 876
(c) 754 (d) 756

98. If $a^2 + \frac{1}{a^2} = \frac{7}{3}$, then what is the value of $\left(a^3 - \frac{1}{a^3}\right)$?

SSC CHSL 03/08/2023 (Shift-03)

(a) $\frac{5}{3\sqrt{3}}$ (b) $\frac{10}{3\sqrt{3}}$
(c) $\frac{7}{3\sqrt{3}}$ (d) $\frac{8}{3\sqrt{3}}$

99. If $x^4 + \frac{1}{x^4} = 727$, $x > 1$, then what is the value of $\left(x - \frac{1}{x}\right)$?

SSC CGL 13/08/2021 (Shift-03)

(a) 6 (b) –6
(c) –5 (d) 5

100. If $x > 1$, and $x^4 + \frac{1}{x^4} = 79$, what is the value of $x - \frac{1}{x}$?

SSC Phase-XI 30/06/2023 (Shift-01)

(a) $2\sqrt{2}$ (b) $\sqrt{11}$
(c) $\sqrt{10}$ (d) $\sqrt{7}$

101. If $x^8 - 1442x^4 + 1 = 0$, then a possible value of $x - \frac{1}{x}$ is :

SSC CGL TIER-II 11/09/2019

(a) 5 (b) 8
(c) 4 (d) 6

102. If $x^8 - 2599x^4 + 1 = 0$, then the positive value of $x - \frac{1}{x}$ will be:

SSC CHSL 19/04/2021 (Shift-03)

(a) 8 (b) 6
(c) 12 (d) 7

103. If $x^4 - 83x^2 + 1 = 0$, then a value of $x^3 - x^{-3}$ can be.

SSC CGL TIER-II 12/09/2019

(a) 758 (b) 756
(c) 739 (d) 737

104. Given that $x^8 - 34x^4 + 1 = 0$, $x > 0$. What is the value of $x^3 - \frac{1}{x^3}$?

SSC CGL 24/08/2021 (Shift-03)

(a) 12 (b) 14
(c) 18 (d) 16

105. If $x^4 - 62x^2 + 1 = 0$, where $x > 0$, then the value of $x^3 + \frac{1}{x^3}$ is:

SSC CGL 24/08/2021 (Shift-03)

(a) 488 (b) 364
(c) 512 (d) 500

◆ TYPE – IV ◆
INVERSE FUNCTION (CONCEPT OF BRIDGING)

106. If $\left(x + \frac{1}{x}\right) = 7$, $x > 0$. The positive value of $\left(x - \frac{1}{x}\right)$ is:

SSC CGL 19/09/2024 (Shift-02)

(a) $5\sqrt{4}$ (b) $5\sqrt{5}$
(c) $3\sqrt{5}$ (d) $4\sqrt{5}$

107. If $\left(w + \frac{1}{w}\right) = 6$, then what will be the value of $\left(w - \frac{1}{w}\right)$?

SSC CHSL 04/08/2023 (Shift-01)

(a) $4\sqrt{2}$ (b) $\sqrt{2}$
(c) $3\sqrt{2}$ (d) $2\sqrt{2}$

108. If x is an integer such that $x + \frac{1}{x} = \frac{65}{8}$, then find the value of $x - \frac{1}{x}$.

SSC CGL 17/09/2024 (Shift-03)

(a) $\frac{63}{6}$ (b) $\frac{63}{8}$
(c) $\frac{36}{8}$ (d) $\frac{32}{6}$

109. If $2x^2 + 5x + 1 = 0$, then one of the values of $x - \frac{1}{2x}$?

SSC CGL TIER-II 29/01/2022

(a) $\frac{\sqrt{17}}{2}$ (b) $\frac{13}{2}$
(c) $\frac{5}{2}$ (d) $\frac{\sqrt{13}}{2}$

110. If $a - \frac{1}{a} = 4$, then the value of $a + \frac{1}{a}$ is:

SSC CPO 05/10/2023 (Shift-02)

(a) $5\sqrt{5}$ (b) $4\sqrt{5}$
(c) $2\sqrt{5}$ (d) $3\sqrt{5}$

111. If $x = \frac{1}{x-5} (x > 0)$, then the value of $x + \frac{1}{x}$ is:

SSC CHSL 02/08/2023 (Shift-03)

(a) $\sqrt{41}$ (b) $\sqrt{29}$
(c) $\sqrt{23}$ (d) $\sqrt{43}$

112. If $x = \frac{1}{x-3}, (x > 0)$, then the value of $x + \frac{1}{x}$ is:

SSC CGL 26/07/2023 (Shift-01)

(a) $\sqrt{11}$ (b) $\sqrt{17}$
(c) $\sqrt{15}$ (d) $\sqrt{13}$

113. If $a = \frac{1}{a - \sqrt{6}} (a > 0)$, then the value of $\left(a + \frac{1}{a}\right)$ is:

SSC CHSL 02/08/2023 (Shift-03)

(a) $\sqrt{6}$ (b) $\sqrt{10}$
(c) $\sqrt{15}$ (d) $\sqrt{7}$

114. If $x + \frac{1}{x} = -14$, and $x < -1$, what will be the value of $x^2 - \frac{1}{x^2}$?

SSC CGL 05/12/2022 (Shift-01)

(a) $-112\sqrt{3}$ (b) $112\sqrt{3}$
(c) $-140\sqrt{2}$ (d) $140\sqrt{2}$

115. If $\left(x - \frac{1}{x}\right)^2 = 12$, what is the value of $\left(x^2 - \frac{1}{x^2}\right)$, given that $x > 0$?

SSC CGL 09/12/2022 (Shift-04)

(a) $6\sqrt{2}$ (b) $8\sqrt{3}$
(c) $6\sqrt{3}$ (d) $8\sqrt{2}$

116. If $x^2 - 7x + 1 = 0$, and $0 < x < 1$, what is the value of $x^2 - \frac{1}{x^2}$?

SSC CGL 19/07/2023 (Shift-03)

(a) $21\sqrt{5}$ (b) $-21\sqrt{5}$
(c) $28\sqrt{5}$ (d) $-28\sqrt{5}$

117. If $x^2 - 3.2x + 1 = 0$ and $x > 1$, the value of $\left(x^2 - \frac{1}{x^2}\right)$ is:

SSC CHSL 11/08/2023 (Shift-03)

(a) $16.8\sqrt{0.39}$ (b) $12.8\sqrt{0.39}$
(c) $16.8\sqrt{0.32}$ (d) $12.8\sqrt{0.32}$

118. If $\left(x^2 + \frac{1}{x^2}\right) = 7$, and $0 < x < 1$, find the value of $x^2 - \frac{1}{x^2}$.

SSC CGL 17/07/2023 (Shift-01)

(a) $3\sqrt{5}$ (b) $4\sqrt{3}$
(c) $-4\sqrt{3}$ (d) $-3\sqrt{5}$

119. If $x > 1$ and $x^2 + \frac{1}{x^2} = 2\sqrt{5}$, what is the value of $x^4 - \frac{1}{x^4}$?

SSC Phase-XI 28/06/2023 (Shift-03)

(a) $4\sqrt{5}$ (b) $4\sqrt{30}$
(c) $8\sqrt{5}$ (d) $8\sqrt{6}$

120. If $\frac{6x}{2x^2 + 5x - 2} = 1$, $x > 0$, then the value of $x^3 + \frac{1}{x^3}$ is:

SSC CGL 07/06/2019 (Shift-03)

(a) $\frac{3}{8}\sqrt{17}$ (b) $\frac{5}{8}\sqrt{17}$
(c) $\frac{5}{16}\sqrt{17}$ (d) $\frac{3}{4}\sqrt{17}$

121. If $\left(x + \frac{1}{x}\right) = 7$ and $x > 1$, then what is the value of $\left(x^3 - \frac{1}{x^3}\right)$?

SSC CHSL 04/08/2023 (Shift-03)

(a) $174\sqrt{5}$ (b) $144\sqrt{5}$
(c) $164\sqrt{5}$ (d) $154\sqrt{5}$

122. If $y + \frac{1}{y} = 11$, then the value of $y^3 - \frac{1}{y^3}$ is:

SSC CGL 09/12/2022 (Shift-04)

(a) $345\sqrt{13}$ (b) $360\sqrt{13}$
(c) $352\sqrt{13}$ (d) $368\sqrt{13}$

123. If $x + \frac{1}{x} = 2\sqrt{10}$ where $x > 1$ then the value of $\left(x^3 - \frac{1}{x^3}\right)$ is:

SSC CGL 11/09/2024 (Shift-01)

(a) 221 (b) 234
(c) 198 (d) 216

124. If $x^2 - 5\sqrt{5}x + 1 = 0$, and $x > 0$, what is the value of $\left(x^3 - \frac{1}{x^3}\right)$

SSC CHSL 08/08/2023 (Shift-02)

(a) 1331 (b) 1364
(c) 1296 (d) 1244

125. If $x^2 - \sqrt{9.76}\,x + 1 = 0$ and $x > 1$, the value of $x^3 - \frac{1}{x^3}$ is :

SSC CHSL 10/08/2023 (Shift-03)

(a) 21.042 (b) 24.024
(c) 21.024 (d) 24.042

126. If $\left(x+\frac{1}{x}\right)=5\sqrt{2}$, and $x > 1$, what is the value of $\left(x^6-\frac{1}{x^6}\right)$?

SSC CHSL 02/08/2023 (Shift-02)

(a) $22970\sqrt{23}$ (b) $23030\sqrt{23}$
(c) $23060\sqrt{23}$ (d) $22960\sqrt{23}$

127. If $\left(x+\frac{1}{x}\right)=2\sqrt{2}$, and $x > 1$, what is the value of $\left(x^6-\frac{1}{x^6}\right)$?

SSC CGL 19/07/2023 (Shift-01)

(a) $140\sqrt{2}$ (b) $116\sqrt{2}$
(c) $144\sqrt{2}$ (d) $128\sqrt{2}$

128. If $\left(x-\frac{1}{x}\right)=2\sqrt{2}$, and $x > 1$, what is the value of $\left(x^6-\frac{1}{x^6}\right)$.

SSC CGL 20/07/2023 (Shift-03)

(a) $372\sqrt{6}$ (b) $384\sqrt{6}$
(c) $396\sqrt{6}$ (d) $420\sqrt{6}$

129. If $\left(x-\frac{1}{x}\right)=\sqrt{6}$, and $x > 1$, what is the value of $\left(x^8-\frac{1}{x^8}\right)$?

SSC CGL 17/07/2023 (Shift-02)

(a) $1024\sqrt{15}$ (b) $992\sqrt{15}$
(c) $998\sqrt{15}$ (d) $1012\sqrt{15}$

130. If $\left(x+\frac{1}{x}\right)= 5$, and $x >1$, what is the value of $\left(x^8-\frac{1}{x^8}\right)$?

SSC CGL 18/07/2023 (Shift-03)

(a) $60605\sqrt{21}$ (b) $60615\sqrt{21}$
(c) $60705\sqrt{21}$ (d) $60725\sqrt{21}$

131. If $\left(x+\frac{1}{x}\right)=3\sqrt{2}$, and $x > 1$, what is the value of $\left(x^8-\frac{1}{x^8}\right)$?

SSC CGL 20/07/2023 (Shift-04)

(a) $24364\sqrt{7}$ (b) $24384\sqrt{11}$
(c) $24384\sqrt{7}$ (d) $12192\sqrt{7}$

132. If $\left(x+\frac{1}{x}\right)=\sqrt{6}$ and $x > 1$, what is the value of $x^8-\frac{1}{x^8}$?

SSC CGL 26/07/2023 (Shift-03)

(a) $120\sqrt{3}$ (b) $128\sqrt{3}$
(c) $112\sqrt{3}$ (d) $108\sqrt{3}$

◆ TYPE – V ◆
INVERSE FUNCTION (UNEQUAL COEFFICIENT)

133. If $\left(0.4x+\frac{1}{x}\right)= 5$, what is the value of $\left(0.064x^3+\frac{1}{x^3}\right)$?

SSC CGL 20/04/2022 (Shift-01)

(a) 119 (b) 125
(c) 110 (d) 105

134. If $\left(5a+\frac{4}{a}-2\right) = 13$ and $a > 0$, what is the value of $\left(25a^2+\frac{16}{a^2}\right)$?

SSC CHSL 10/08/2023 (Shift-04)

(a) 158 (b) 157
(c) 185 (d) 175

135. If $x^2 - 4x - 3 = 0$, then what is the value of $\dfrac{\left(x^4-\frac{27}{x^2}\right)}{(x^2+4x-3)}$?

SSC PHASE-IX 2022

(a) $9\frac{1}{4}$ (b) $12\frac{1}{2}$
(c) $10\frac{1}{2}$ (d) $9\frac{1}{8}$

136. If $x + \frac{1}{9x} = 3$, then the value of $9x^2 + \frac{1}{9x^2}$ is:

SSC CGL 11/09/2024 (Shift-03)

(a) 87 (b) 81
(c) 77 (d) 79

137. If $7b-\frac{1}{4b} = 7$, then what is the value of $16b^2+\frac{1}{49b^2}$?

SSC CGL 14/07/2023 (Shift-01)

(a) $\frac{80}{49}$ (b) $\frac{104}{7}$
(c) $\frac{120}{7}$ (d) $\frac{7}{2}$

138. If $x+\frac{1}{15x} = 3$, then the value of $9x^3+\frac{1}{375x^3}$ will be:

SSC CHSL 10/08/2021 (Shift-01)

(a) 237.6 (b) 367.2
(c) 273.6 (d) 376.2

139. If $x + \frac{1}{16x} = 3$, then the value of $16x^3+\frac{1}{256x^3}$ is :

SSC CGL TIER-II 12/09/2019

(a) 423 (b) 441
(c) 432 (d) 414

◆ TYPE – VI ◆
INVERSE FUNCTION (SPECIAL CASES)

140. If $x + \frac{1}{x} = 2$, then find the value of $\left(x^{2723}+\frac{1}{x^{3356}}\right)$.

SSC CGL 18/09/2024 (Shift-02)

(a) 1 (b) 2
(c) 0 (d) –1

141. If $x + \frac{1}{x} = 2$ then find the value of $x^{1823} + \frac{1}{x^{1929}}$

SSC CHSL 07/08/2023 (Shift-01)

(a) 2 (b) 1
(c) 0 (d) -1

142. If $\left(x+\frac{1}{x}\right)= 2$, then $x^7+\frac{1}{x^{117}} =$

SSC CGL 19/07/2023 (Shift-04)

(a) 1 (b) 2
(c) 4 (d) 3

143. If $x + \frac{1}{x} = 2$, then find the value of $\left(x^4+\frac{4}{x^4}\right)\left(x^3-\frac{4}{x^3}\right)$.

SSC CPO 27/06/2024 (Shift-03)

(a) –15 (b) 15
(c) –10 (d) 10

144. If $a^3 + \frac{1}{a^3} = 2$ $(a > 0)$, then the value of $a + \frac{1}{a}$ is:

SSC CGL 25/09/2024 (Shift-01)

(a) 1 (b) 3
(c) 2 (d) 4

145. If $k + \frac{1}{k} + 2 = 0$ and $k < 0$, then what is the value of $k^{17}+\frac{1}{k^{11}}$?

SSC CHSL 09/03/2023 (Shift-03)

(a) – 17 (b) – 2
(c) – 1 (d) 0

146. If $x = 7 - 4\sqrt{3}$, then find the value of $\left(x^2+\frac{1}{x^2}\right)$.

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 195 (b) 197
(c) 196 (d) 194

147. If $x = 7 - 4\sqrt{3}$, then find the value of $\left(x^2+\frac{1}{x^2}\right)$.

SSC CGL 18/09/2024 (Shift-01)

(a) 188 (b) 194
(c) 186 (d) 196

148. If $x = 8+\sqrt{5}$ and $y = 8-\sqrt{5}$ then the value of $x^2 + y^2$ is:

SSC CGL TIER-II (18/01/2025)

(a) 138 (b) 143
(c) 140 (d) 124

149. If $x = 4 + \sqrt{6}$ and $y = 4 - \sqrt{6}$ then the value of $x^2 + y^2$ is:

SSC CGL TIER-II (20/01/2025)

(a) 43 (b) 42
(c) 51 (d) 44

150. If $x = \sqrt{6} + 2$, and $y = \sqrt{6}-2$, then what is the value of $\left(\frac{x}{y}+\frac{y}{x}\right)^2 - 3$?

SSC CGL 26/09/2024 (Shift-02)

(a) 42 (b) 97
(c) 35 (d) 22

151. If $p = 7 + 4\sqrt{3}$, then what is the value of $\frac{p^6 + p^4 + p^2 + 1}{p^3}$?

SSC CGL 06/12/2022 (Shift-02)

(a) 2716 (b) 2167
(c) 2717 (d) 2176

152. If $x = \frac{\sqrt{5} - 2}{\sqrt{5} + 2}$, then the value of $x^2 + x^{-2}$ is :

SSC CGL 02/12/2022 (Shift-01)

(a) 350 (b) 345
(c) 284 (d) 322

153. If $x = \frac{\sqrt{5} - \sqrt{4}}{\sqrt{5} + \sqrt{4}}$ and $y = \frac{\sqrt{5} + \sqrt{4}}{\sqrt{5} - \sqrt{4}}$ then the value of $\frac{x^2 - xy + y^2}{x^2 + xy + y^2}$?

SSC CGL 08/12/2022 (Shift-02)

(a) $\frac{361}{363}$ (b) $\frac{341}{343}$
(c) $\frac{384}{387}$ (d) $\frac{321}{323}$

154. If $p = \frac{\sqrt{2} + 1}{\sqrt{2} - 1}$ and $q = \frac{\sqrt{2} - 1}{\sqrt{2} + 1}$ then find the value of $\frac{p^2}{q} + \frac{q^2}{p}$.

SSC CGL 18/07/2023 (Shift-04)

(a) 200 (b) 196
(c) 198 (d) 188

155. If $a = (\sqrt{2} - 1)^{\frac{1}{3}}$, then the value of $\left(a - \frac{1}{a}\right)^3 + 3\left(a - \frac{1}{a}\right)$ is:

SSC CPO 29/06/2024 (Shift-03)

(a) 2 (b) −2
(c) $\sqrt{2}$ (d) $-\sqrt{2}$

156. If $x = (\sqrt{6} - 1)^{\frac{1}{3}}$, then the value of $\left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$ is:

SSC CHSL 09/08/2023 (Shift-01)

(a) $\frac{2\sqrt{6} - 6}{5}$ (b) $\frac{4\sqrt{6} - 6}{5}$
(c) $\frac{4\sqrt{6} - 6}{3}$ (d) $\frac{4\sqrt{3} - 6}{5}$

157. If $\left(x + \frac{1}{x}\right)^2 = 3$, then what is the value of $x^6 + x^{-6}$?

SSC CGL TIER-II 08/08/2022

(a) 6 (b) 2
(c) −2 (d) −6

158. If $N + \frac{1}{N} = \sqrt{3}$, then find the value of $N^6 + \frac{1}{N^6} + 11$.

SSC CHSL 15/03/2023 (Shift-01)

(a) − 11 (b) 9
(c) − 2 (d) 11

◆ TYPE – VII ◆
INVERSE FUNCTION (MISCELLANEOUS QUESTIONS)

159. If $x^2 - 15x + 1 = 0$, what is the value of $x^4 - 223x^2 + 6$?

SSC CGL 25/07/2023 (Shift-01)

(a) 9 (b) 5
(c) 6 (d) 0

160. If $x + \frac{1}{x} = 8$, then find the value of $\frac{5}{x^2 - 8x + 2}$.

SSC CGL 02/12/2022 (Shift-04)

(a) 3 (b) 4
(c) 0 (d) 5

161. If $x^2 - 11x + 1 = 0$, what is the value of $x^8 - 14159x^4 + 11$?

SSC CHSL 08/08/2023 (Shift-01)

(a) 9 (b) 10
(c) 12 (d) 11

162. If $x^2 - 8x + 1 = 0$, what is the value of $x^8 - 3842x^4 + 1$?

SSC CHSL 27/05/2022 (Shift-03)

(a) − 1 (b) 0
(c) 2 (d) 1

163. If $x(x - 5) = -1$, then the value of $x^3(x^3 - 110)$?

SSC CPO 11/11/2022 (Shift-01)

(a) 0 (b) −1
(c) 1 (d) 2

164. If $x^4 + x^{-4} = 194$, $(x > 0)$, then the value of $(x - 2)^2$ is :

SSC CGL 04/06/2019 (Shift-01)

(a) 1 (b) 6
(c) 2 (d) 3

165. If $8k^6 + 15k^3 - 2 = 0$, then the positive value of $\left(k + \frac{1}{k}\right)$ is:

SSC CGL 12/04/2022 (Shift-03)

(a) $2\frac{1}{2}$ (b) $2\frac{1}{8}$
(c) $8\frac{1}{2}$ (d) $8\frac{1}{8}$

166. If $x^2 + 7x + 8 = 0$, then find the value of $\frac{4x}{x^2 - 5x + 8}$

SSC CGL 25/09/2024 (Shift-01)

(a) $\frac{1}{2}$ (b) $\frac{-1}{4}$
(c) $\frac{-1}{3}$ (d) $\frac{1}{6}$

167. If $x^2 + 6x + 1 = 0$, then the value of $(x + 6)^3 + \frac{1}{(x + 6)^3} = ?$

SSC CPO 10/11/2022 (Shift-03)

(a) 245 (b) 216
(c) 186 (d) 198

168. If $A + \frac{1}{A} = -1$, then find the value of $\frac{A^6 + A^3 - 1}{A^9 + A^3 - 1}$?

SSC CHSL 16/03/2023 (Shift-02)

(a) 0 (b) −1
(c) 2 (d) 1

169. If $\left(x^2 - \frac{1}{x^2}\right) = 4\sqrt{6}$, and $x > 1$, what is the value of $\left(x^3 - \frac{1}{x^3}\right)$?

SSC CGL 21/07/2023 (Shift-03)

(a) $20\sqrt{2}$ (b) $24\sqrt{2}$
(c) $18\sqrt{2}$ (d) $22\sqrt{2}$

170. If $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{5}$, $x \neq 0$, then what is the value of $\frac{\left(x^4 + \frac{1}{x^2}\right)}{(x^2 + 1)}$?

SSC CGL 20/04/2022 (Shift-02)

(a) 46 (b) 42
(c) 48 (d) 44

171. If $2x - \frac{1}{x} = 3, x \neq 0$, then find the value of $8x^6 - 25x^3 - 1$.

SSC PHASE-IX 2022

(a) $27x^3$ (b) $34x^3$
(c) $18x^3$ (d) $20x^3$

172. If $2x - \frac{1}{x} = 7$, $x \neq 0$, then what is the value of $\frac{8x^6 + 5x^3 - 1}{8x^6 - 25x^3 - 1}$?

SSC PHASE-IX 2022

(a) $-\frac{1}{5}$ (b) $\frac{19}{18}$
(c) $\frac{39}{37}$ (d) $\frac{13}{12}$

173. If $2x - y = 2$ and $xy = \frac{3}{2}$, then what is the value of $x^3 - \frac{y^3}{8}$?

SSC CGL TIER-II 29/01/2022

(a) $\frac{9}{2}$ (b) $-\frac{5}{4}$
(c) $\frac{13}{4}$ (d) $\frac{5}{2}$

174. If $4x^4 - 37x^2 + 9 = 0$, $x > \sqrt{\frac{3}{2}}$, then what is the value of $8x^3 - \frac{27}{x^3}$?

SSC CGL 16/08/2021 (Shift-02)

(a) 215 (b) −215
(c) 35 (d) −35

◆ TYPE – VIII ◆
SQUARE FORMULAE (TWO VARIABLES)

175. Which of the following is an identity?

SSC CHSL 04/08/2023 (Shift-02)

(a) $(a - b)^2 = a^2 - b^2$
(b) $(a + b)^2 = a^2 + b^2 + 2ab$
(c) $(a + b)^2 = a^2 + b^2$
(d) $(a - b)^2 = a^2 - b^2 - 2ab$

176. The algebraic expression $2x^2 - 32$ is equal ______ .

SSC CHSL 07/08/2023 (Shift-02)

(a) $2(x - 4)^2$ (b) $(x + 4)(x - 4)$
(c) $2(x + 4)^2$ (d) $2(x + 4)(x - 4)$

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177. The value of $(x + y)^2 + (x - y)^2$ is equal to:

SSC CGL 25/09/2024 (Shift-02)

(a) $2(x + y)^2$ (b) $2(x^2 + y^2)$
(c) $(2x + 2y)^2$ (d) $4xy$

178. Simplify the following expression $49a^2 + 70ab + 25b^2$

SSC Phase-XII 26/06/2024 (Shift-02)

(a) $(7a - 5b)^2$ (b) $(7a + 5b)^2$
(c) $(5a + 7b)^2$ (d) $(5a - 7b)^2$

179. Simplify $\dfrac{(x^2-9)}{x+3}$

SSC CGL 09/09/2024 (Shift-01)

(a) $x + 3$ (b) $x - 3$
(c) $\sqrt{x^2-9}$ (d) $x - 9$

180. Simplify the expression $\dfrac{l^2-m^2}{(l+m)^2}$, provided $(l + m) \neq 0$.

SSC CGL 20/07/2023 (Shift-01)

(a) $\dfrac{l+m}{l-m}$ (b) $\dfrac{l-m}{l+m}$
(c) 0 (d) l

181. Find the value of the expression $\dfrac{x^2-1}{x-1} - \dfrac{x^2-9}{x-3}$.

SSC CHSL 02/08/2023 (Shift-04)

(a) 1 (b) −2
(c) −1 (d) 2

182. Simplify the given expression $\dfrac{(4x^2+9y^2-12xy)}{(3y-2x)}$

SSC CGL 18/09/2024 (Shift-03)

(a) $2y - 3x$ (b) $3y - 2x$
(c) $2x - 3y$ (d) $3x - 2y$

183. Simplify $\dfrac{4x^2-49y^2}{2x+7y} + 7y - 2x$

SSC CGL 26/09/2024 (Shift-03)

(a) $4x - 14y$ (b) $7y$
(c) $4x$ (d) 0

184. Simplify, $\dfrac{x^4-2x^2+1}{x^2-2x+1}$

SSC CGL 17/07/2023 (Shift-02)

(a) $x^2 - 2x + 1$ (b) $x^2 + 2x + 2$
(c) $x^2 + 2x + 1$ (d) $x^2 + x + 1$

185. What is the value of $\dfrac{9x^2+12xy+4y^2}{36}$.

SSC CHSL 21/03/2023 (Shift-01)

(a) $\left(\dfrac{x}{3}+\dfrac{y}{2}\right)^2$ (b) $\left(\dfrac{x}{2}-\dfrac{y}{3}\right)^2$
(c) $\left(\dfrac{x}{2}+\dfrac{y}{3}\right)^2$ (d) $\left(\dfrac{x}{4}+\dfrac{y}{3}\right)^2$

186. If $a + b + c = 0$, then the value of $(a^2 + b^2 + 2ab)$ is equal to:

SSC CGL 23/09/2024 (Shift-02)

(a) c^2 (b) $-c^2$
(c) c (d) $-c$

187. Simplify the following expression. $(3x + 17 - 2y)(3x - 17 - 2y)$

SSC CGL 24/09/2024 (Shift-01)

(a) $9x^2 - 12xy + 4y^2 + 289$
(b) $9x^2 + 12xy + 4y^2 + 289$
(c) $9x^2 - 12xy + 4y^2 - 289$
(d) $9x^2 - 6xy + 4y^2 - 289$

188. What is the value of $\dfrac{1+x^2}{1-x} \div \dfrac{1-x^4}{x-1} \times \dfrac{x(1-x)}{(1+x)}$?

SSC CHSL 09/03/2023 (Shift-01)

(a) $\dfrac{-x}{1+2x^2}$ (b) $\dfrac{-x}{1+x}$
(c) $\dfrac{-x}{(1+x)^2}$ (d) $\dfrac{-x}{1+x^2}$

189. What is the value of $\dfrac{1+x}{1-x^2} + \dfrac{1+x}{1-x^4} - \dfrac{1-x^4}{1-x} \times \dfrac{(1+x)}{1-x^2}$

SSC CHSL 20/03/2023 (Shift-03)

(a) $\dfrac{2x(1+x^2)}{(1-x)}$ (b) $\dfrac{2x(1+x^2)}{(x-1)}$
(c) $(1 - x)^2$ (d) $(1 + x)^2$

190. Simplify the following expression. $\dfrac{(a^2+b^2-c^2)^2-(a^2-b^2+c^2)^2}{b^2-c^2}$

SSC CHSL 04/08/2023 (Shift-04)

(a) $3a^2$ (b) $4a^2$
(c) $5a^2$ (d) $2a^2$

191. Expand and simplify the algebraic expression: $(x - 5)^2 + (x + 3)^2 + 4x$

SSC CGL 26/07/2023 (Shift-04)

(a) $2(x^2 - 17)$
(b) $2(x^2 + 17)$
(c) $(x^2 + 17)$
(d) $2(x^2 - 5x + 17)$

192. What is the value of $(a - b)(b + a)(a^2 + b^2)(2a^4 + 2b^4)$?

SSC CHSL 10/03/2023 (Shift-01)

(a) $a^4 - b^4$ (b) $a^8 - b^8$
(c) $2(a^8 - b^8)$ (d) $(a^8 - b^8)/2$

193. If $(x + 1)^2 + (x + 2)^2 = 16$, then what is the value of $4x^2 + 12x + 40$?

SSC CHSL 16/03/2023 (Shift-03)

(a) 62 (b) 74
(c) 56 (d) 52

194. If $16y^2 - k = \left(4y+\dfrac{3}{2}\right)\left(4y-\dfrac{3}{2}\right)$, then the value of k is:

SSC CPO 09/11/2022 (Shift-03)

(a) $\dfrac{9}{4}$ (b) $\dfrac{11}{4}$
(c) $\dfrac{6}{4}$ (d) $\dfrac{7}{4}$

195. Simplify the following expression. $[(1 + p)(1 + p^2)(1 + p^4)(1 + p^8)(1 + p^{16})(1 - p) - 1]$

SSC CGL 21/07/2023 (Shift-03)

(a) $-p^{32}$ (b) p^{32}
(c) $(1 + p^{32})$ (d) $(1 - p^{32})$

196. What is the simplified form of the expression $(1 + x)(1 + x^2)(1 + x^4)(1 + x^8)(1 - x)$?

SSC CGL TIER-II 03/03/2023

(a) $1 - x^{40}$ (b) $1 - x^{32}$
(c) $1 - x^{16}$ (d) $1 - x^{42}$

197. What is the value of $\left(k-\dfrac{1}{k}\right)\left(k^2+\dfrac{1}{k^2}\right)\left(k^4+\dfrac{1}{k^4}\right)\left(k^8+\dfrac{1}{k^8}\right)\left(k^{16}+\dfrac{1}{k^{16}}\right)$?

SSC CHSL 15/03/2023 (Shift-02)

(a) $k^{64} - \dfrac{1}{k^{64}}$ (b) $\dfrac{k^{32}-\dfrac{1}{k^{32}}}{k-\dfrac{1}{k}}$
(c) $k^{32} - \dfrac{1}{k^{32}}$ (d) $\dfrac{k^{32}-\dfrac{1}{k^{32}}}{k+\dfrac{1}{k}}$

198. If $A = \dfrac{58^2-25^2}{46^2-37^2}$, $B = \dfrac{26^2-15^2}{56^2-15^2}$, then the value of $\dfrac{1}{B} - \dfrac{20}{A}$ is:

SSC CGL TIER-II 26/10/2023

(a) 2 (b) 1
(c) 0 (d) − 1

199. If $a + b = 10$ and $a^2 + b^2 = 58$, find the value of ab.

SSC CHSL 03/08/2023 (Shift-03)

(a) 24 (b) 27
(c) 30 (d) 21

200. If $2a + 3b = 14$ and $2a - 3b = 10$, then find the value of 'ab'.

SSC CHSL 03/08/2023 (Shift-04)

(a) 5 (b) 3
(c) 4 (d) 2

201. If $x + y = 10$ and $xy = 12$, find the value of $x^2 - xy + y^2$.

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 78 (b) 74
(c) 64 (d) 82

202. If $(a - 2b) = 8$ and $2ab = 9$, then find the value of $(a + 2b)$.

SSC CHSL TIER-II 02/11/2023

(a) 6 (b) 12
(c) 10 (d) 8

203. If $5x + 3y = 15$ and $2xy = 6$, then the value of $5x - 3y$ is:

SSC CHSL 02/08/2023 (Shift-01)

(a) $3\sqrt{3}$ (b) $3\sqrt{5}$
(c) $3\sqrt{2}$ (d) $3\sqrt{4}$

204. If $2p + 5q = 12$ and $pq = 3$, find the value of $4p^2 + 25q^2$?

SSC CHSL 10/03/2023 (Shift-02)

(a) 64 (b) 24
(c) 84 (d) 44

205. If $4x^2 + y^2 = 40$ and $xy = 6$, then find the value of $2x + y$.

SSC CGL TIER-II 06/03/2023

(a) 8 (b) 6
(c) 4 (d) 5

206. If $a + b = 11$ and $ab = 35$, then what is the value of $(a^4 + b^4)$?

SSC CGL 01/12/2022 (Shift-03)

(a) 151 (b) 261
(c) 124 (d) 102

207. If $x - y = 1$ and $x^3 + y^3 = 41$ where $x, y \geq 0$, then the value of $x + y$ will be:

SSC CGL 03/12/2022 (Shift-02)

(a) 9 (b) 8
(c) 6 (d) 7

208. If $x^2 - 2xy = 84$ and $x - y = -10$, then the value of y is:

SSC CGL 05/12/2022 (Shift-04)

(a) 2
(b) 1
(c) 4
(d) 3

209. If a + b = 12 and ab = 35, find the value of $a^4 + b^4 - 10^3$?

SSC CHSL 24/05/2022 (Shift-02)

(a) 2226
(b) 2026
(c) 2126
(d) 1226

210. If $x + y = 12$ and $xy = 6$, then the value of $\frac{x}{y} + \frac{y}{x}$ is equal to:

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 18
(b) 22
(c) 24
(d) 26

211. If $x + y = 18$ and $xy = 9$, then the value of $\left(\frac{x}{y} + \frac{y}{x}\right)$ will be:

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 38
(b) 32
(c) 36
(d) 34

212. If $a^2 + b^2 = 148$ and $ab = 54$, then find the value of $\frac{a+b}{a-b}$.

SSC CGL 25/09/2024 (Shift-03)

(a) $\frac{8}{\sqrt{10}}$
(b) $\frac{2}{\sqrt{10}}$
(c) $8\sqrt{7}$
(d) $5\sqrt{3}$

213. If $x^2 + y^2 = 427$ and $xy = 202$, then find the value of $\frac{x+y}{x-y}$.

SSC CHSL 08/08/2023 (Shift-03)

(a) $\sqrt{\frac{835}{23}}$
(b) $\sqrt{\frac{830}{29}}$
(c) $\sqrt{\frac{831}{23}}$
(d) $\sqrt{\frac{830}{23}}$

214. Which of the following statement is correct?

I. The value of $100^2 - 99^2 + 98^2 - 97^2 + 96^2 - 95^2 + 94^2 - 93^2 + ... + 2^2 - 1^2$ is 5050.

II. If $8x + \frac{8}{x} = -16$ and $x < 0$, then the value of $x^{197} + x^{-197}$ is 2.

SSC CGL 02/12/2022 (Shift-04)

(a) Only I
(b) Only II
(c) Both I and II
(d) Neither I nor II

215. Which of the following statement is correct?

I. The value of $100^2 - 99^2 + 98^2 - 97^2 + 96^2 - 95^2 + 94^2 - 93^2 + ... + 22^2 - 21^2$ is 4840.

II. The value of $\left(k^2 + \frac{1}{k^2}\right)\left(k - \frac{1}{k}\right)\left(k^4 + \frac{1}{k^4}\right)\left(k + \frac{1}{k}\right)\left(k^4 - \frac{1}{k^4}\right)$ is $k^{16} - \frac{1}{k^{16}}$

SSC CGL 05/12/2022 (Shift-02)

(a) Neither I nor II
(b) Only II
(c) Only I
(d) Both I and II

216. If $x + y = 1$ and $xy(xy - 2) = 12$, then the value of $x^4 + y^4$ is :

SSC CGL 04/06/2019 (Shift-03)

(a) 19
(b) 25
(c) 20
(d) 23

◆ TYPE – IX ◆
CUBE FORMULAE (TWO VARIABLES)

217. If $\frac{x}{y} + \frac{y}{x} = 1$ and $x + y = 2$, then the value of $x^3 + y^3$ is:

SSC CPO 03/10/2023 (Shift-01)

(a) 0
(b) 1
(c) 3
(d) 2

218. If $\frac{a}{b} + \frac{b}{a} = 1, a \neq 0, b \neq 0$, then find the value of $\frac{a^3 + b^3}{3ab}$.

SSC CPO 28/06/2024 (Shift-03)

(a) 3
(b) 0
(c) 2
(d) –4

219. The value of the expression $(1.55^2 + 0.55^2 + 1.55 \times 0.55)$ is equal to:

SSC CGL 11/09/2024 (Shift-02)

(a) $1.55^2 - 0.55^2$
(b) $1.55^3 - 0.55^3$
(c) $1.55^3 + 0.55^3$
(d) $1.55^2 + 0.55^2$

220. The simplified form of $(x + 2y)^3 + (x - 2y)^3$ is:

SSC CGL 05/12/2022 (Shift-01)

(a) $2x^3 + 24xy^2$
(b) $2x^3 - 24xy^2$
(c) $x^3 - 8y^3$
(d) $x^3 + 8y^3$

221. $3\left[a - \frac{1}{a}\right] + \left[a - \frac{1}{a}\right]^3 = ?$

SSC CGL 07/12/2022 (Shift-02)

(a) $a^2 - \frac{1}{a^3}$
(b) $a^3 - \frac{1}{a^3}$
(c) $a^3 + \frac{1}{a^3}$
(d) $a^2 - \frac{1}{a^2}$

222. Simplify $(x + y)^3 - (x - y)^3 - 6y(x^2 - y^2)$

SSC CPO 10/11/2022 (Shift-03)

(a) $8y^3$
(b) x^3
(c) $8x^3$
(d) y^3

223. If $(x + y)^3 - (x - y)^3 - 3y(2x^2 - 3y^2) = ky^3$, then find the value of k.

SSC CGL 19/04/2022 (Shift-03)

(a) 10
(b) 8
(c) 10.5
(d) 11

224. Simplify the given expression

$$\frac{(x+3)^3 + (x-3)^3}{x^2 + 27}$$

SSC CHSL 14/08/2023 (Shift-01)

(a) $3x$
(b) x
(c) $4x$
(d) $2x$

225. If $\frac{(17)^3 - (7)^3}{(17^2 + 7^2 + k)} = 10$, then what is the value of k ?

SSC CHSL 21/03/2023 (Shift-03)

(a) 102
(b) 119
(c) 136
(d) 85

226. If $\frac{3(16^3 - 6^3)}{(16^2 + 6^2 + Q)} = 30$, then find the value of Q.

SSC CGL 26/09/2024 (Shift-01)

(a) 96
(b) 98
(c) 112
(d) 108

227. If $x - y = 25$ and $xy = 444$, compute the value of $x^3 - y^3$.

SSC CPO 28/06/2024 (Shift-02)

(a) 48925
(b) 42985
(c) 28495
(d) 26725

228. If a – b = 5 and ab = 25, then the value of $a^3 - b^3$ is:

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 525
(b) 500
(c) 450
(d) 400

229. If a + b = 10 and ab = 6, then the value of $a^3 + b^3$ is:

SSC CPO 03/10/2023 (Shift-01)

(a) 860
(b) 820
(c) 800
(d) 840

230. If $2x + 3y = 9$, and $xy = 3$, what is $8x^3 + 27y^3$?

SSC CHSL 03/08/2023 (Shift-01)

(a) 235
(b) 244
(c) 243
(d) 234

231. If $(x + 6y) = 8$, and $xy = 2$, where $x > 0$, what is the value of $(x^3 + 216y^3)$?

SSC CGL 11/04/2022 (Shift- 01)

(a) 288
(b) 224
(c) 368
(d) 476

232. If $a^3 + b^3 = 217$ and a + b = 7, then the value of ab is:

SSC CPO 24/11/2020 (Shift-02)

(a) –6
(b) –1
(c) 7
(d) 6

233. If (a – b) = 9, and $(a^3 - b^3) = 4401$, find the value of ab.

SSC CHSL 02/08/2023 (Shift-02)

(a) 190
(b) 112
(c) 162
(d) 136

234. If 3a + 2b = 27 and $27a^3 + 8b^3 = 1458$, then find 2ab.

SSC CGL 18/09/2024 (Shift-03)

(a) 72
(b) 70
(c) 77
(d) 75

235. If $x + y = 1$, then what is the value of $x^3 + 3xy + y^3$?

SSC CGL TIER-II 08/08/2022

(a) 0
(b) 2
(c) 1
(d) –1

236. If $x + y + 3 = 0$, then find the value of $x^3 + y^3 - 9xy + 9$.

SSC CGL 11/04/2022 (Shift-01)

(a) – 18
(b) – 36
(c) 18
(d) 36

237. If $x = 3y + 4$, then what is the value of $(x^3 - 27y^3 - 36xy)$?

SSC CPO 27/06/2024 (Shift-02)

(a) 27
(b) 64
(c) 1
(d) 8

238. If 2a – b = 3 and $8a^3 - b^3 = 999$, then the value of $4a^2 - b^2$.

SSC CGL 26/09/2024 (Shift-02)

(a) 63
(b) 65
(c) 61
(d) 67

239. If $a^3 + 3a^2 + 3a = 63$, then the value of $a^2 + 2a$ is :

SSC CHSL 14/03/2023 (Shift-02)

(a) 22 (b) 19
(c) 15 (d) 8

240. If $xy = -6$ and $x^3 + y^3 = 19$ (x and y are integers), then what is the value of $\frac{1}{x^{-1}} + \frac{1}{y^{-1}}$?

SSC CGL TIER-II (08/08/2022)

(a) –2 (b) 2
(c) –1 (d) 1

241. If $2x + 3y = 4$ and $4x^2 + 9y^2 = 64$, then what is the value of $8x^3 + 27y^3$.

SSC CHSL 04/08/2023 (Shift-04)

(a) 253 (b) 235
(c) 352 (d) 325

242. If $x^3 = 184 + y^3$ and $x = 4 + y$, then the value of $(x + y)$ is (given that $x > 0$ and $y > 0$):

SSC Phase-XII 21/06/2024 (Shift-02)

(a) $2\sqrt{14}$ (b) $2\sqrt{11}$
(c) $-2\sqrt{14}$ (d) $-2\sqrt{11}$

243. If $x^3 = 270 + y^3$ and $x = (6+y)$ then what is the value of $(x + y)$? (given that $x > 0$ andy > 0)

SSC CHSL 03/08/2023 (Shift-04)

(a) $2\sqrt{3}$ (b) $\sqrt{3}$
(c) $4\sqrt{3}$ (d) $3\sqrt{3}$

244. If $a^3 + b^3 = 218$ and $a + b = 2$, then the value of $\sqrt{1-ab}$ is:

SSC CGL 19/04/2022 (Shift-01)

(a) 5 (b) 3
(c) 4 (d) 6

245. If $x - y = 11$ and $\frac{1}{x} - \frac{1}{y} = \frac{11}{24}$, then what is the value of $x^3 - y^3 + x^2y^2$?

SSC CGL 13/08/2021 (Shift-02)

(a) 1331 (b) 1115
(c) 1105 (d) 1307

246. What is the coefficient of x in the expansion of $(3x - 4)^3$?

SSC CGL 20/08/2021 (Shift-03)

(a) –144 (b) –108
(c) 108 (d) 144

247. What is the constant term in the expansion of $\left(5x^2 - \frac{1}{x}\right)^3$

SSC CGL 18/08/2021 (Shift-02)

(a) 5 (b) –15
(c) 15 (d) 75

248. If $(4x+2y)^3 + (4x-2y)^3 = 16(Ax^3 + Bxy^2)$, then what is the value of $\frac{1}{2}\left(\sqrt{A^2 + B^2}\right)$?

SSC CGL 11/04/2022 (Shift-02)

(a) 8 (b) 3
(c) 5 (d) 7

249. If $a^3 + 3a^2 + 3a = 7$, then the value of $a^2 + 2a$ is:

SSC CGL 17/09/2024 (Shift-02)

(a) 3 (b) 1
(c) 2 (d) 4

250. If, $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = \left(\sqrt{2}x - \sqrt{3}y\right)(Ax^2 - Bxy + Cy^2)$ then the value of $(A^2 + B^2 + C^2)$ is:

SSC CGL 13/04/2022 (Shift-02)

(a) 11 (b) 16
(c) 18 (d) 19

251. If $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = \left(\sqrt{2}x - \sqrt{3}y\right)(Ax^2 + By^2 + Cxy)$, then the value of $A^2 + B^2 - C^2$ is:

SSC CGL TIER-II 11/09/2019

(a) 11 (b) 7
(c) 19 (d) 10

252. If $27x^3 - 64y^3 = (Ax + By)(Cx^2 - Dy^2 + 12xy)$, then the value of $4A + B + 3C + 2D$ is:

SSC CGL TIER-II 03/02/2022

(a) 5 (b) 3
(c) – 3 (d) – 4

253. If $(54\sqrt{2}x^3 + 24\sqrt{3}y^3) \div (\sqrt{18}x + \sqrt{12}y)(Ax^2 + By^2 + Cxy)$, then what is the value of $A^2 - (B^2 + C^2)$?

SSC CGL 17/08/2021 (Shift-01)

(a) 24 (b) 12
(c) –24 (d) –36

254. If $(8x^3 - 27y^3) \div (2x - 3y) = (Ax^2 + Bxy + Cy^2)$, then the value of $(2A + B - C)$ is:

SSC CGL 06/06/2019 (Shift-01)

(a) 4 (b) 6
(c) 5 (d) 3

255. If $8(x + y)^3 - 27(x - y)^3 = (5y - x)(Ax^2 + By^2 + Cxy)$, then what is the value of $(A + B - C)$?

SSC CGL 13/08/2021 (Shift 01)

(a) 16 (b) –26
(c) 36 (d) –16

256. If $27(x + y)^3 - 8(x - y)^3 = (x + 5y)(Ax^2 + By^2 + Cxy)$, then what is the value of $(A + B - C)$?

SSC CGL TIER-II 15/11/2020

(a) 13 (b) 16
(c) 18 (d) 11

◆ TYPE – X ◆
CONCEPT OF PERFECT SQUARE

257. If $(a - 18)^2 + (b - 12)^2 + (c - 6)^2 = 0$, then find the value of $(a + b + c)^{\frac{1}{2}}$

SSC CPO 28/06/2024 (Shift-02)

(a) ±3 (b) ±6
(c) ±4 (d) ±2

258. If $x^2 + 4y^2 + 2x + 1 = 0$, then find the value of $x^{39} + y^{36}$.

SSC CPO 29/06/2024 (Shift-02)

(a) –1 (b) –2
(c) 2 (d) 1

259. If $a^2 + b^2 + c^2 = 2(a + c - 1)$, then the value of $a^3 + b^3 + c^3 = ?$

SSC CGL 12/09/2024 (Shift-03)

(a) 0 (b) 2
(c) 4 (d) 1

260. If $x^2 + y^2 + z^2 = 2(x + z - 1)$, then the value of $x^3 + y^3 + z^3$ is equal to:

SSC CHSL 11/08/2023 (Shift-03)

(a) 6 (b) 1
(c) 2 (d) 8

261. If $x^2 + y^2 + 2y + 4x + 5 = 0$, then $\frac{x+y}{x-y}$.

SSC CGL 07/12/2022 (Shift-01)

(a) –3 (b) $\frac{1}{3}$
(c) –1 (d) 3

262. If $x^2 + 8y^2 - 12y - 4xy + 9 = 0$ then the value of $(7x - 8y)$ is:

SSC CPO 23/11/2020 (Shift-02)

(a) 9 (b) 5
(c) 12 (d) 21

263. If $a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$ then the value of $(a + b - 7c)$ is:

SSC CGL 12/04/2022 (Shift-02)

(a) 4 (b) 3
(c) 2 (d) 1

◆ TYPE – XI ◆
SQUARE FORMULAE (THREE VARIABLES)

264. What is the value of the given expression ? $(a + b + c)^2 - a^2 - b^2 - c^2$

SSC CGL 17/07/2023 (Shift-03)

(a) 2abc
(b) 2 (ab + bc + ca)
(c) 2 (a + b + c)
(d) 2ab + bc – 2ca

265. The algebraic expression $25x^2 + 16y^2 + 9z^2 - 40xy + 24yz - 30zx$ is equal to:

SSC Phase-X 02/08/2022 (Shift-02)

(a) $(4y + 3z - 5x)^2$
(b) $(4y - 3z - 5x)(4x + 5y + 3z)$
(c) $(4y + 3z - 5x)(4x + 5y - 3z)$
(d) $(4y - 3z - 5x)^2$

266. If $(a + b + c) = 16$, and $(a^2 + b^2 + c^2) = 90$, find the value of $(ab + bc + ca)$.

SSC CGL 14/07/2023 (Shift-01)

(a) 84 (b) 83
(c) 82 (d) 81

267. If $(x + y + z) = 23$ and $x^2 + y^2 + z^2 = 179$ then find the value of $(xy + yz + zx)$.

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 225 (b) 280
(c) 175 (d) 350

268. If $a + b + c = 15$ and $ab + bc + ca = 22$, then find the value of $a^2 + b^2 + c^2$

SSC CHSL 07/08/2023 (Shift-01)

(a) 131 (b) 141
(c) 161 (d) 181

269. If $x + y + z = 4$ and $x^2 + y^2 + z^2 = 12$, then find $xy + yz + xz$.

SSC CGL 20/07/2023 (Shift-02)

(a) 4 (b) 6
(c) 7 (d) 2

270. If $a^2 + b^2 + c^2 = 6.25$ and $(ab + bc + ca) = 0.52$, what is the value of $(a + b + c)$, if $(a + b + c) < 0$?

SSC CGL 11/04/2022 (Shift-03)

(a) ± 2.7 (b) – 2.7
(c) – 2.8 (d) ± 2.8

271. If $a + b - c = 5$ and $ab - bc - ac = 10$, then find the value of $a^2 + b^2 + c^2$.

SSC CGL 18/04/2022 (Shift-01)

(a) 15 (b) 45
(c) 5 (d) 40

272. If $a + b + c = 0$ and $a^2 + b^2 + c^2 = 40$, then what is the value of $4ab + 4bc + 4ca$?

SSC CHSL 10/03/2023 (Shift-01)

(a) – 40 (b) – 20
(c) – 160 (d) – 80

273. If $9a + 9b + 9c = 81$ and $4ab + 4bc + 4ca = 160$, then what is the value of $6a^2 + 6b^2 + 6c^2$?

SSC CHSL 14/03/2023 (Shift-04)

(a) 1 (b) 3
(c) 4 (d) 6

274. If $\frac{(a + b + c)}{2} = 16$ and $2ab + 2bc + 2ca = 120$, then what is the value of $4a^2 + 4b^2 + 4c^2$?

SSC CHSL 20/03/2023 (Shift-01)

(a) 2828 (b) 3368
(c) 3616 (d) 3056

275. Find the value of $a^2 + b^2 + c^2 - 2ab + 2ac - 2bc$, if $a = x + y$, $b = x - y$ and $c = 2x - 1$.

SSC Phase-X 04/08/2022 (Shift-03)

(a) $(x - y - 1)^2$ (b) $(2x + 2y - 1)^2$
(c) 0 (d) $(2x - 2y - 1)^2$

276. If $x + y + z = 13$, $x^2 + y^2 + z^2 = 91$ and $xz = y^2$, then the difference between z and x is:

SSC CHSL 05/08/2021 (Shift-01)

(a) 3 (b) 8
(c) 5 (d) 9

277. If $x + y + z = 19$, $x^2 + y^2 + z^2 = 133$ and $xz = y^2$, $x > z > 0$, what is the value of $(x - z)$?

SSC CPO 25/11/2020 (Shift-01)

(a) 0 (b) 5
(c) – 2 (d) – 5

◆ TYPE – XII ◆
CUBE FORMULAE (THREE VARIABLES)

278. If $a + b + c = 6$, $a^2 + b^2 + c^2 = 14$ and $ab + bc + ca = 11$, then what is the value of $a^3 + b^3 + c^3 - 3abc$?

SSC CGL 02/12/2022 (Shift-03)

(a) 31 (b) 12
(c) 18 (d) 42

279. Simplify the given expression

$$\frac{x^3 + y^3 + z^3 - 3xyz}{(x - y)^2 + (y - z)^2 + (z - x)^2}$$

SSC CHSL 07/08/2023 (Shift-04)

(a) $\frac{1}{3}(x + y + z)$ (b) $(x + y + z)$
(c) $\frac{1}{4}(x + y + z)$ (d) $\frac{1}{2}(x + y + z)$

280. What is the value of

$(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)(a + b + 2c)$?

SSC CHSL 13/03/2023 (Shift-01)

(a) $a^3 + b^3 + 8c^3 - 8abc$
(b) $a^3 + b^3 + 6c^3 - 4abc$
(c) $4a^3 + b^3 + 8c^3 - 9abc$
(d) $a^3 + b^3 + 8c^3 - 6abc$

281. If $a + b + c = 15$ and $ab + bc + ca = 35$, then find the value of $a^3 + b^3 + c^3 - 3abc$.

SSC CPO 29/06/2024 (Shift-01)

(a) 2100 (b) 1500
(c) 1200 (d) 1800

282. If $a + b + c = 13$ and $ab + bc + ca = 22$, then the value of $a^3 + b^3 + c^3 - 3abc$ is ____.

SSC CPO 29/06/2024 (Shift-02)

(a) 1911 (b) 1225
(c) 1625 (d) 1339

283. If $a + b + c = 5$ and $ab + bc + ca = 7$, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

SSC CPO 05/10/2023 (Shift-01)

(a) 20 (b) 25
(c) 15 (d) 30

284. If $(a + b + c) = 14$, and $(a^3 + b^3 + c^3 - 3abc) = 98$, find the value of $(ab + bc + ca)$.

SSC CGL 26/07/2023 (Shift-04)

(a) 60 (b) 64
(c) 65 (d) 63

285. If $a + b + c = 12$ and $ab + bc + ca = 22$, then what is the value of $a^3 + b^3 + c^3 - 3abc$?

SSC CHSL 13/03/2023 (Shift-04)

(a) 1052 (b) 936
(c) 924 (d) 876

286. If $x + y + z = 1$, $xy + yz + zx = -1$ and $xyz = -1$, then $(x^3 + y^3 + z^3)$ is equal to ________.

SSC CPO 27/06/2024 (Shift-01)

(a) 0 (b) 1
(c) 2 (d) 3

287. If $a + b + c = 7$, $ab + bc + ca = 11$ and $abc = -1$, then $a^3 + b^3 + c^3$ is equal to:

SSC CGL 20/07/2023 (Shift-03)

(a) 101 (b) 107
(c) 109 (d) 111

288. If $(a + b + c) = 20$, and $a^2 + b^2 + c^2 = 152$, find the value of $a^3 + b^3 + c^3 - 3abc$.

SSC CGL 19/07/2023 (Shift-04)

(a) 560 (b) 640
(c) 480 (d) 720

289. If $(a + b + c) = 12$, and $(a^2 + b^2 + c^2) = 50$, find the value of $(a^3 + b^3 + c^3 - 3abc)$.

SSC CGL 19/07/2023 (Shift-02)

(a) 36 (b) 24
(c) 42 (d) 48

290. If the sum of three numbers is 18 and the sum of their squares is 36, then find the difference between the sum of their cubes and three times of their product.

SSC CGL 10/09/2024 (Shift-01)

(a) 1449 (b) –1944
(c) –1494 (d) 4149

291. If $a + b + c = 5$ and $a^2 + b^2 + c^2 = 15$, then find the value of $a^3 + b^3 + c^3 - 3abc - 27$.

SSC CHSL 08/08/2023 (Shift-03)

(a) 23 (b) 27
(c) 25 (d) 21

292. If $x + y + z = 2$, $x^3 + y^3 + z^3 - 3xyz = 74$, then $(x^2 + y^2 + z^2)$ is equal to:

SSC CGL 23/08/2021 (Shift-03)

(a) 22 (b) 29
(c) 26 (d) 24

293. If $a = 355$, $b = 356$, $c = 357$ find $a^3 + b^3 + c^3 - 3abc = ?$

SSC CHSL 15/10/2020 (Shift-01)

(a) 3208 (b) 3202
(c) 3206 (d) 3204

294. If $x = 110$, $y = 111$, $z = 112$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

SSC CPO 28/06/2024 (Shift-01)

(a) 999 (b) 991
(c) 997 (d) 995

295. If $a = 2022$, $b = 2021$ and $c = 2020$, then value of $a^2 + b^2 + c^2 - ab - bc - ca$ is:

SSC CHSL 26/05/2022 (Shift-03)

(a) 2 (b) 4
(c) 3 (d) 1

296. Find the value of $(a^3 + b^3 + c^3 - 3abc)$, where $a = 335$, $b = 215$ and $c = 180$.

SSC CHSL 04/08/2023 (Shift-03)

(a) 15452630 (b) 14502230
(c) 14472250 (d) 15421320

297. If $(a^3 + b^3 + c^3 - 3abc) = 405$, and $(a + b + c) = 15$, find the value of $(a - b)^2 + (b - c)^2 + (c - a)^2$.

SSC CGL 20/07/2023 (Shift-01)

(a) 27 (b) 54
(c) 18 (d) 45

298. If $(a^3 + b^3 + c^3 - 3abc) = 405$, and $(a - b)^2 + (b - c)^2 + (c - a)^2 = 54$, find the value of $(a + b + c)$.

SSC CGL 26/07/2023 (Shift-02)

(a) 15 (b) 45
(c) 9 (d) 27

299. What is the value of

$(a + b + c)\{(a - b)^2 + (b - c)^2 + (c - a)^2\}$?

SSC CHSL 13/03/2023 (Shift-01)

(a) $2a^3 + 2b^3 + 2c^3$
(b) $2a^3 + 2b^3 + 2c^3 - 6abc$
(c) 3abc
(d) 6abc

300. If $x = 32.5$, $y = 34.6$ and $z = 30.9$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is 0.98k, where k is equal to:

SSC CGL TIER-II 03/02/2023

(a) 1033 (b) 933
(c) 1026 (d) 921

301. What is the value of $a^3 + b^3 + c^3$ if $(a + b + c) = 0$?

SSC CGL 14/07/2023 (Shift-02)

(a) $a^2 + b^2 + c^2 - 3abc$
(b) 0
(c) 3abc
(d) $a^2 + b^2 + c^2 - ab - bc - ca$

302. If $x + y + z = 0$, then what is the value of

$$\frac{x}{(yz)^2} + \frac{y}{(xz)^2} + \frac{z}{(xy)^2} \ ?$$

SSC CHSL 21/03/2023 (Shift-01)

(a) $\frac{xyz}{3}$ (b) $\frac{3}{xyz}$

(c) xyz (d) $\frac{1}{xyz}$

303. Simplify the following expression.

$$\frac{(x-y)^3+(y-z)^3+(z-x)^3}{(x-y)(y-z)(z-x)}$$

SSC CGL 13/09/2024 (Shift-01)

(a) 3 (b) 1

(c) 0 (d) 2

304. Simplify the expression

$$\frac{(u-v)^3+(v-w)^3+(w-u)^3}{(u^2-v^2)^3+(v^2-w^2)^3+(w^2-u^2)^3}$$

SSC CHSL 04/08/2023 (Shift-01)

(a) $\frac{1}{(u+v)(v+w)(w+u)}$

(b) 1

(c) $\frac{3}{(u+v)(v+w)(w+u)}$

(d) 0

305. Simplify the following expression.

$$\frac{5(a^6-b^6)^3+5(b^6-c^6)^3+5(c^6-a^6)^3}{2(a^3-b^3)^3+2(b^3-c^3)^3+2(c^3-a^3)^3}$$

SSC CGL 24/08/2021 (Shift-02)

(a) $\frac{5}{2}(a^3+b^3)(b^3+c^3)(c^3+a^3)$

(b) $\frac{5}{2}(a^3+b^3)(b^3-c^3)(c^3-a^3)$

(c) $\frac{5}{2}(a^3-b^3)(b^3+c^3)(c^3+a^3)$

(d) $\frac{5}{2}(a^3-b^3)(b^3-c^3)(c^3+a^3)$

306. Simplify the following expression:

$$\frac{(a^2-4b^2)^3+64(b^2-4c^2)^3+(16c^2-a^2)^3}{(a-2b)^3+(2b-4c)^3+(4c-a)^3}$$

SSC CGL 11/04/2022 (Shift-02)

(a) $-(a+2b)(b+2c)(4c+a)$

(b) $2(a+2b)(b+2c)(4c+a)$

(c) $(a+2b)(b+2c)(4c+a)$

(d) $4(a+2b)(b+2c)(4c+a)$

307. If $a + b = c$, then the expression $a^3 + b^3 - c^3 + 3abc$ will be equal to:

SSC CGL 24/09/2024 (Shift-03)

(a) 0 (b) 3

(c) 2 (d) 1

308. If $a + 2b + 3c = 0$, then what is the value of $(a^3 + 8b^3 + 27c^3)$?

SSC CPO 28/06/2024 (Shift-01)

(a) 18 abc (b) 12 abc

(c) 0 (d) 6 abc

309. If $8a^3 + b^3 + 27c^3 = 18\,abc$, then the relation among a, b and c is:

SSC CGL 17/09/2024 (Shift-02)

(a) $b + 3c = 2a$

(b) $2a + b = 3c$

(c) $2a + 3c = b$

(d) $b + 3c = -2a$

310. If $(5x + 1)^3 + (x - 3)^3 + 8(3x - 4)^3 = 6(5x + 1)(x - 3)(3x - 4)$, then x is equal to:

SSC CGL TIER-II 12/09/2019

(a) $\frac{5}{6}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

311. If $(x + 6)^3 + (2x + 3)^3 + (3x + 5)^3 = (3x + 18)(2x + 3)(3x + 5)$, then what is the value of x?

SSC CGL 23/08/2021 (Shift-02)

(a) $\frac{7}{3}$ (b) $-\frac{5}{3}$

(c) $\frac{5}{3}$ (d) $-\frac{7}{3}$

312. Given that $(5x - 3)^3 + (2x + 5)^3 + 27(4 - 3x)^3 = 9(3 - 5x)(2x + 5)(3x - 4)$, then the value of $(2x + 1)$ is:

SSC CGL TIER-II 13/09/2019

(a) – 13 (b) 15

(c) – 15 (d) 13

313. If $ab + bc + ca = 8$ and $a^2 + b^2 + c^2 = 20$, then possible value of $\frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$ is:

SSC CGL 06/06/2019 (Shift-01)

(a) 72 (b) 56

(c) 84 (d) 80

314. If $(a + b + c) = 19$, and $(a^2 + b^2 + c^2) = 155$, find the value of $(a - b)^2 + (b - c)^2 + (c - a)^2$.

SSC CGL 18/07/2023 (Shift-02)

(a) 104 (b) 108

(c) 100 (d) 98

315. If $(a + b + c) = 17$, and $(a^2 + b^2 + c^2) = 101$, find the value of $(a - b)^2 + (b - c)^2 + (c - a)^2$.

SSC CHSL 09/08/2023 (Shift-02)

(a) 12 (b) 14

(c) 10 (d) 16

316. If $a + b + c = 6$ and $a^2 + b^2 + c^2 = 14$, then what is the value of $(a - b)^2 + (b - c)^2 + (c - a)^2$?

SSC CGL 18/07/2023 (Shift-04)

(a) – 8 (b) 8

(c) 10 (d) 6

317. If $p = 106$, $q = 105$ and $r = 104$, then value of $p^2 + q^2 + r^2 - pq - qr - rp$ is:

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 2 (b) 0

(c) 1 (d) 3

318. If $a = 101$, $b = 102$ and $c = 103$, then $a^2 + b^2 + c^2 - ab - bc - ca$

SSC CGL 24/07/2023 (Shift-01)

(a) 2 (b) 4

(c) 3 (d) 6

319. If $a = 2022$, $b = 2021$ and $c = 2020$, then value of $a^2 + b^2 + c^2 - ab - bc - ca$ is:

SSC CHSL 26/05/2022 (Shift-03)

(a) 2 (b) 4

(c) 3 (d) 1

320. If $p + q + r = pqr = \frac{1}{p} + \frac{1}{q} + \frac{1}{r} = 1$, then find $p^3 + q^3 + r^3$.

SSC CGL 25/07/2023 (Shift-02)

(a) 1 (b) –1

(c) 5 (d) –5

◆ TYPE – XIII ◆
CONCEPT OF VALUE PUTTING

321. Determine the value of the product $(4a + 3b)(16a^2 - 12ab + 9b^2)$ for $a = 2$ and $b = 3$.

SSC CPO 29/06/2024 (Shift-01)

(a) 1131 (b) 1141

(c) 1231 (d) 1241

322. What is the value of $(3x^3 + 5x^2y + 12xy^2 + 7y^3)$, when $x = -4$ and $y = -1$?

SSC CGL 14/07/2023 (Shift-01)

(a) –329 (b) –359

(c) –361 (d) –327

323. What is the value of $64x^3 + 38x^2y + 20xy^2 + y^3$, when $x = 3$ and $y = -4$?

SSC CGL 14/07/2023 (Shift-02)

(a) 1236 (b) 488

(c) 536 (d) 1256

324. If $a = 17$, $b = 13$, then find the value of the expression $(a^3 - b^3 - 3a^2b + 3ab^2)$

SSC CGL 14/07/2023 (Shift-04)

(a) –64 (b) –2700

(c) 2700 (d) 64

325. What is the value of $(27x^3 - 58x^2y + 31xy^2 - 8y^3)$, when $x = -5$ and $y = -7$?

SSC CGL 17/07/2023 (Shift-04)

(a) – 1924 (b) 1928

(c) –1926 (d) 1924

326. If $x = 7$ and $y = 2$ then, what is the value of $\frac{x^3 - y^3}{x^2 - y^2} - \frac{3xy}{x + y}$?

SSC CHSL 10/03/2023 (Shift-01)

(a) $\frac{28}{9}$ (b) $\frac{21}{10}$

(c) $\frac{25}{9}$ (d) $\frac{26}{9}$

327. If $x = -2$ and $y = 1$, then what is the value of $\left(\frac{4}{x} + y\right)\left(\frac{16}{x^2} + y^2 - \frac{4y}{x}\right)$?

SSC CHSL 20/03/2023 (Shift-04)

(a) – 5 (b) 7

(c) – 7 (d) 5

328. If $2a + 2b + c = 0$, then find the value of $\frac{4a^2 + 4b^2 + 4c^2}{5c^2 - 8ab}$.

SSC CPO 29/06/2024 (Shift-03)

(a) –1 (b) $-2\sqrt{3}$

(c) 1 (d) $2\sqrt{3}$

329. If $x^2 + y^2 + z^2 = xy + yz + zx$ and $x = 1$, then find the value of $\frac{10x^4 + 5y^4 + 7z^4}{13x^2y^2 + 6y^2z^2 + 3z^2x^2}$

SSC CGL 05/12/2022 (Shift-04)

(a) 2 (b) 0

(c) –1 (d) 1

330. If a + b + c = 0, then what is the value of $\frac{(b+c)^2}{bc}+\frac{(c+a)^2}{ca}+\frac{(a+b)^2}{ab}$?

SSC CGL 18/08/2021 (Shift-03)

(a) 1
(b) −3
(c) −1
(d) 3

331. If α + β + γ = 0, then $\frac{3\beta^2+\alpha^2+\gamma^2}{2\beta^2-\alpha\gamma}=$?

SSC CPO 27/06/2024 (Shift-02)

(a) $\frac{1}{2}$
(b) 1
(c) 2
(d) $\frac{1}{4}$

332. If $x^2+y^2+z^2=xy+yz+zx$, then the value of $\left(\frac{17x^4+9y^4+16z^4}{8x^2y^2+6y^2z^2+10z^2x^2}\right)$ is:

SSC Phase-XII 24/06/2024 (Shift-02)

(a) 1.75
(b) 3.25
(c) 2.00
(d) 2.50

333. If p + q + r = 0, then what is the simplified value of the expression

$$\left(\frac{p^2}{p^2-qr}+\frac{q^2}{q^2-pr}+\frac{r^2}{r^2-pq}\right)$$

SSC CHSL 03/08/2023 (Shift-02)

(a) 0
(b) 2
(c) 1
(d) − 1

334. Simplify the following expression
$\{[x-5)(x-1)]-[(9x-5)(9x-1)]\}\div 16x$

SSC CHSL 07/08/2023 (Shift-01)

(a) $2x(5x-3)$
(b) $-(5x-3)$
(c) $x(5x-3)$
(d) $-6x(5x-3)$

335. If $a^2+b^2+c^2=ab+bc+ca$, then the value of $\frac{11a^4+13b^4+15c^4}{16a^2b^2+19b^2c^2+17c^2a^2}$ is:

SSC CHSL 09/08/2023 (Shift-03)

(a) $1\frac{1}{3}$
(b) $\frac{1}{4}$
(c) $\frac{3}{4}$
(d) $1\frac{3}{4}$

336. If $l+m+n=0$, the what will be the value of $\left(\frac{l^2}{mn}+\frac{m^2}{nl}+\frac{n^2}{lm}\right)^2$?

SSC CHSL 10/08/2023 (Shift-02)

(a) 9
(b) 16
(c) 4
(d) 1

337. Simplify:
$(2a-3b-c)^2-(a+2b+c)^2$

SSC CHSL 11/08/2023 (Shift-02)

(a) $3a^2+5b^2-16ab+2bc-8ac$
(b) $3a^2+5b^2-8ab+2bc-6ac$
(c) $3a^2+5b^2-16ab-6ac$
(d) $3a^2+5b^2-16ab+2bc-6ac$

338. If $a^2+b^2+c^2=ab+bc+ac$, then the value of $\frac{11a^4+13b^4+17c^4}{17a^2b^2+9b^2c^2+15c^2a^2}$ is:

SSC CGL 18/07/2023 (Shift-03)

(a) 1
(b) 2
(c) 11
(d) 4

339. Simplify the given expression.
$(a-2b)(b-3a)+(a+b)(a-3b)$
$-(b-3a)(4a-5b)$

SSC CGL 21/07/2023 (Shift-01)

(a) $8a^2-10ab$
(b) $8a^2+10ab$
(c) $10a^2-14ab$
(d) $10a^2-4ab$

340. The value of $\frac{p^2-(q-r)^2}{(p+r)^2-q^2}+\frac{q^2-(p-r)^2}{(p+q)^2-r^2}+\frac{r^2-(p-q)^2}{(q+r)^2-p^2}$ is:

SSC CGL 24/07/2023 (Shift-01)

(a) 1
(b) 2
(c) 0
(d) 3

341. If ab + bc + ca = 0, then find the value of $\frac{1}{a^2-bc}+\frac{1}{b^2-ca}+\frac{1}{c^2-ab}$.

SSC Phase-XI 30/06/2023 (Shift-01)

(a) 0
(b) $\frac{1}{ab}$
(c) 1
(d) ab

342. If abc = 5, what is the value of

$$\left(\frac{1}{1+a+b^{-1}}+\frac{1}{1+b+5c^{-1}}+\frac{1}{1+\frac{c}{5}+a^{-1}}\right)?$$

SSC CGL 08/12/2022 (Shift-03)

(a) 5
(b) 1
(c) 0
(d) (a + b + c)

343. If $a^2+b^2+1=2a$, then the value of a^4+b^7 is:

SSC CPO 10/11/2022 (Shift-02)

(a) 1
(b) 0
(c) 2
(d) 4

344. If a, b and c are positive integers such that $a^2+b^2=82$ and $b^2+c^2=65$, then the value of 2a + 7b − 3c is

SSC CPO 11/11/2022 (Shift-01)

(a) 2
(b) 5
(c) 49
(d) 1

◆ TYPE – XIV ◆
MISCELLANEOUS QUESTIONS

345. What is the value of $\frac{X}{Y}$ If $\frac{X-5Y}{X+5Y}=\frac{7}{13}$

SSC CGL 17/07/2023 (Shift-04)

(a) $\frac{27}{7}$
(b) $\frac{24}{9}$
(c) $\frac{50}{3}$
(d) $\frac{100}{7}$

346. Find the value of Y, if X − 2Y + 2Z = 16, X − Y + Z = 9 and 2X − 3Y − Z = 9.

SSC CGL TIER-II (18/01/2025)

(a) 2
(b) −3
(c) −4
(d) 4

347. If $x=11$, then the value of $(x^5-12x^4+12x^3-12x^2+12x-1)$ is:

SSC CPO 28/06/2024 (Shift-03)

(a) 10
(b) 8
(c) 9
(d) 14

348. If $x=a+\frac{1}{a}$ and $y=a-\frac{1}{a}$ then $\sqrt{x^4+y^4-2x^2y^2}$ is equal to :

SSC CGL 06/06 2019 (Shift-01)

(a) $16a^2$
(b) 8
(c) $\frac{8}{a^2}$
(d) 4

349. The factors of x^4+x^2+25 are:

SSC CGL 03/12/2022 (Shift-01)

(a) $(x^2+3x-5)(x^2-3x+5)$
(b) $(x^2+3x+5)(x^2-3x+5)$
(c) $(x^2-3x+5)(x^2-3x+5)$
(d) $(x^2+3x+5)(x^2+3x+5)$

350. The factors of $x^2+4y^2+4y-4xy-2x-8$ are:

SSC CGL 08/12/2022 (Shift-01)

(a) $(x-2y-4)(x-2y+2)$
(b) $(x^2-2y-4)(x^2-2y+2)$
(c) $(x+2y-4)(x+2y+2)$
(d) $(x^2-2y-4)(x^2+2y+2)$

351. If $(x-2)$ is a factor of $(2x^2+12kx-25k)$, then what is the value of k?

MTS 01/09/2023 (Shift-02)

(a) 8
(b) 2
(c) 6
(d) 4

352. $(mx+n)$ is a factor of:

SSC CGL 03/12/2022 (Shift-04)

(a) $m^2x^2+2nx+n^2$
(b) $m^2x^2+2mnx+n^2$
(c) $m^2x^2+2mx+n^2$
(d) $m^2x^2+2mn+n^2$

353. If $a^4+b^4+a^2b^2=273$ and $a^2+b^2-ab=21$, then one of the values of $\left(\frac{1}{a}+\frac{1}{b}\right)$ is:

SSC CGL 24/08/2021 (Shift-01)

(a) $-\frac{9}{4}$
(b) $-\frac{3}{4}$
(c) $\frac{9}{8}$
(d) $\frac{3}{2}$

354. If $16a^4+36a^2b^2+81b^4=91$ and $4a^2+9b^2-6ab=13$, then what is the value of 3ab?

SSC CGL 04/03/2020 (Shift-01)

(a) − 3
(b) $\frac{3}{2}$
(c) 5
(d) $-\frac{3}{2}$

355. If $1+x^2+x^4=585$ and $1-x+x^2=65$, then find the value of $1+x+x^2$.

SSC CHSL 26/05/2022 (Shift-03)

(a) 8
(b) 7
(c) 6
(d) 9

356. If $x^4+y^4+x^2y^2=17\frac{1}{16}$ and $x^2-xy+y^2=5\frac{1}{4}$, then one of the values of $(x-y)$ is:

SSC CGL TIER-II 03/02/2022

(a) $\frac{5}{2}$
(b) $\frac{3}{4}$
(c) $\frac{5}{4}$
(d) $\frac{3}{2}$

357. If $x^4+y^4+x^2y^2=21$ and $x^2+y^2+xy=7$, then what is the value of $\frac{1}{x^2}+\frac{1}{y^2}$?

SSC CGL 17/08/2021 (Shift-03)

(a) $\frac{3}{4}$
(b) $-\frac{3}{4}$
(c) $-\frac{5}{2}$
(d) $\frac{5}{4}$

358. If $2^x = 3^y = 6^{-z}$, then $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ is equal to:

SSC Phase X 01/08/2022 (Shift-03)

(a) 1 (b) $\frac{3}{2}$

(c) 0 (d) $\frac{-1}{2}$

359. If $2^{x+y-2z} = 8^{8z-5-y}$; $5^{4y-6z} = 25^{y+z}$; $3^{4x-3z} = 9^{x+z}$ then the value of $2x + 3y + 5z$ is :

SSC CHSL 13/10/2020 (Shift-01)

(a) 56 (b) 44

(c) 32 (d) 28

360. What is the value of the following expression?

$$2^2\left(\frac{x^a}{x^b}\right)^{(a+b)} \times 3^2\left(\frac{x^b}{x^c}\right)^{(b+c)} \times 6^{-2}\left(\frac{x^c}{x^a}\right)^{(a+c)}$$

SSC CHSL 08/06/2022 (Shift-02)

(a) 1 (b) 0

(c) 4 (d) 9

361. Let a + b = 2c, then which of the following expression is true?

SSC CGL 09/09/2024 (Shift-03)

(a) $a^2 + 2ac = b^2 + 2bc$

(b) $a^2 - 2ac = b^2 - 2ac$

(c) $a^2 + 2bc = b^2 + 2ac$

(d) $a^2 - ac = b^2 - bc$

362. If x, y and z are positive numbers and $x + y + z = 1$, then the least value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is:

SSC CGL 09/09/2024 (Shift-03)

(a) 7 (b) 5

(c) 9 (d) 11

363. Simplify the following expression.

$$\left(\frac{3}{a}+3a\right)\left(\frac{9}{a^2}-9+9a^2\right) \text{ if } a = 1$$

SSC CGL 11/09/2024 (Shift-03)

(a) 27 (b) 63

(c) 81 (d) 54

364. Let $t = \frac{2}{5}$, then the value of the expression $t^3 + \left(\frac{3}{5}\right)^3 + \frac{9}{5}t$ is:

SSC CGL 12/09/2024 (Shift-01)

(a) $\frac{1}{5}$ (b) 1

(c) 2 (d) $\frac{1}{2}$

365. Simplify

$$\frac{25a^2 - 10ab - 48b^2}{5a + 6b} \times (5a + 8b)$$

SSC CGL 13/09/2024 (Shift-02)

(a) $25a^2 - 64b^2$ (b) $(5a - 8b)^2$

(c) $(5a + 8b)^2$ (d) $25a^2 - 36b^2$

366. Let, a + b = 1, then the value of $\left(\frac{1}{a^2}+\frac{1}{b^2}+\frac{2}{ab}\right)$ is:

SSC CGL 13/09/2024 (Shift-02)

(a) $\frac{1}{a^2b^2}$ (b) $\frac{1}{ab}$

(c) $\frac{1}{a^2b}$ (d) $\frac{1}{ab^2}$

367. Simplify the following expression.

$(g - h)^2 - (g + h)^2 + 4gh$

SSC CGL 13/09/2024 (Shift-03)

(a) 4gh (b) –4gh

(c) 4 (d) 0

368. If $\sqrt{a} = 3b$, then $\frac{a}{b^2}$ is equal to:

SSC CHSL 08/08/2023 (Shift-02)

(a) $\frac{1}{6}$ (b) 6

(c) $\frac{1}{9}$ (d) 9

369. The algebraic expression $4x^2 - y^2 + 6y - 9$ is equal to ....

SSC CHSL 09/08/2023 (Shift-01)

(a) $(2x + y - 3)(2x - y + 3)$

(b) $(2x - y - 3)(2x - y + 3)$

(c) $(2x + y - 3)^2$

(d) $(2x + y + 3)^2$

370. Simplify the following.

$$\frac{3a+b}{2} - \frac{a-3b}{3} + 2b$$

SSC CGL 19/07/2023 (Shift-01)

(a) $\frac{5(a+3b)}{6}$ (b) $\frac{7a+3b}{6}$

(c) $\frac{7(a+3b)}{6}$ (d) $\frac{a+3b}{6}$

371. Select the correct algebraic expression.

SSC CGL 05/12/2022 (Shift-03)

(a) ab – a – b + 1 = (a – 1) (b – 1)

(b) ab + a – b + 1 = (1 – a) (a – b) (1 + a) (a + b)

(c) ab – a – b + 1 = (1 – a)(b – 1)

(d) ab – a – b + 1 = (a – 1) (1 – b)

372. If $4(z + 7)(2z - 1) = Az^2 + Bz + C$, then the value of A + B + C is:

SSC CGL 08/12/2022 (Shift-03)

(a) 28 (b) 32

(c) 74 (d) 81

373. Which of the following statement is correct?

I. If $x = 12$, $y = -2$ and $z = -10$, then $x^3 + y^3 + z^3 = 360$.

II. If $x + y = 18$ and $4xy = 128$, then $4x^2 + 4y^2 = 4480$.

SSC CGL 13/12/2022 (Shift-01)

(a) Neither I nor II

(b) Only I

(c) Both I and II

(d) Only II

374. Factorize the given algebraic expression.

$x^3 + 27y^3 + 64z^3 - 36xyz$

SSC Phase-X 02/08/2022 (Shift-02)

(a) $(x + 3y + 4z)(x^2 + 9y^2 + 16z^2 + 3xy + 12$[illegible]$ + 4xz)$

(b) $(x + 3y$ [illegible] $z)(x^2 + 9y^2 + 16z^2 - 12xy^2 +$ [illegible] $- 4xz)$

(c) $(x -$ [illegible] $- 4z)(x^2 + 9y^2 + 16z^2 - 3xy - 12yz - 4xz)$

(d) $(x + 3y + 4z)(x^2 + 9y^2 + 16z^2 - 3xy - 12yz - 4xz)$

375. If $x^2 + 4y^2 + 3z^2 + \frac{19}{4} = 2\sqrt{3}(x + y + z)$, then the value of $(x - 4y + 3z)$ is:

SSC CHSL 05/08/2021 (Shift-01)

(a) $\frac{\sqrt{3}}{2}$ (b) $\sqrt{3}$

(c) $2\sqrt{3}$ (d) $\frac{\sqrt{3}}{3}$

376. If $\sqrt{\frac{a}{b}} = \frac{8}{3} + \sqrt{\frac{b}{a}}$ and $(a+b) = 30$, then what is the value of ab?

SSC CHSL 03/08/2023 (Shift-01)

(a) 64 (b) 28

(c) 81 (d) 36

377. If $\sqrt{\frac{a}{b}} = \frac{8}{3} - \sqrt{\frac{b}{a}}$ and $a - b = 10$, then the value of ab is :

SSC CHSL 04/08/2023 (Shift-02)

(a) $32\frac{1}{7}$ (b) $32\frac{3}{7}$

(c) $32\frac{4}{7}$ (d) $32\frac{2}{7}$

378. Simplify the expression:

$$\frac{1}{8}\left[\frac{1}{b-1} - \frac{1}{b+1} - \frac{2}{b^2+1} - \frac{4}{b^4+1}\right]$$

SSC CHSL 14/08/2023 (Shift-03)

(a) $\frac{1}{b^8-1}$ (b) $\frac{8}{b^8+1}$

(c) $\frac{8}{b^8-1}$ (d) $\frac{1}{b^8+1}$

379. If $ax + by = 1$ and $bx + ay = \frac{2ab}{a^2+b^2}$, then the value of x (in terms of a and b) is:

SSC CHSL 11/08/2023 (Shift-04)

(a) $\frac{2b}{a^2+b^2}$ (b) $\frac{a}{a^2+b^2}$

(c) $\frac{b}{a^2+b^2}$ (d) $\frac{2a}{a^2+b^2}$

380. What is the value of $\left(\frac{1}{a}-\frac{1}{b}-\frac{1}{c}\right)$ if $\frac{2a-5}{a} - \frac{4b-5}{b} + \frac{6c+5}{c} = 0$?

SSC CGL 21/07/2023 (Shift-02)

(a) $\frac{4}{5}$ (b) $-\frac{8}{5}$

(c) $\frac{2}{5}$ (d) $-\frac{12}{5}$

381. If $\frac{2x}{x+2} + \frac{1}{2x+4} - \frac{12-x}{2x^2+4x} = a + \frac{b}{x}$ where a and b are integers, then the value of ab = _____.

SSC Phase-XI 27/06/2023 (Shift-04)

(a) 3 (b) – 6

(c) 6 (d) – 3

382. If $mx^m - nx^n = 0$, then what is the value of $\frac{1}{x^m + x^n} + \frac{1}{x^m - x^n}$ in terms of x^n is:
Where x, m, n are > 0

SSC CGL 06/12/2022 (Shift-04)

(a) $\frac{2mn}{\left(x^n\left(n^2+m^2\right)\right)}$ (b) $\frac{2mn}{\left(x^n\left(m^2-n^2\right)\right)}$
(c) $\frac{2mn}{\left(x^n\left(m^2+n^2\right)\right)}$ (d) $\frac{2mn}{\left(x^n\left(n^2-m^2\right)\right)}$

383. If $y = 1+\sqrt{3}+\sqrt{4}$, then the value of $2y^4 - 8y^3 - 6y^2 + 28y - 84$ is:

SSC CGL 08/12/2022 (Shift-02)

(a) $40\sqrt{3}$ (b) $80\sqrt{3}$
(c) $20\sqrt{3}$ (d) $60\sqrt{3}$

384. If $\frac{r}{13} + \frac{13}{r} = 1$ then the value of r^3 is:

SSC CGL 13/12/2022 (Shift-03)

(a) –2157 (b) 2197
(c) 2157 (d) –2197

385. If $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$, then find the value of $x^3 - 6x^2 + 18x$.

SSC CGL 13/12/2022 (Shift-04)

(a) 40 (b) 33
(c) 45 (d) 22

386. The value of

$$\frac{\left\{\left(m^2+n^2\right)(m-n)-(m-n)^3\right\}}{\left(m^2n-mn^2\right)}$$ is:

SSC CPO 09/11/2022 (Shift-03)

(a) m + n (b) m – n
(c) 2 (d) m/n

387. If $x = \sqrt{1+\frac{\sqrt{3}}{2}} - \sqrt{1-\frac{\sqrt{3}}{2}}$, then the value of $\frac{\sqrt{2}-x}{\sqrt{2}+x}$ will be closest to:

SSC CGL TIER-II 11/09/2019

(a) 0.17 (b) 0.12
(c) 1.4 (d) 1.2

388. If $x = \sqrt{1+\frac{\sqrt{3}}{2}} - \sqrt{1-\frac{\sqrt{3}}{2}}$ then the value of $\frac{\sqrt{3}-x}{\sqrt{3}+x}$ (correct to one decimal place) is?

SSC CGL TIER-II 29/01/2022

(a) 0.25 (b) 0.17
(c) 0.19 (d) 0.27

389. If $x^2 + y^2 = 280$ and $xy = 120$, then find the value of $\frac{x-y}{x+y}$.

SSC CGL 10/09/2024 (Shift-03)

(a) $\frac{1}{\sqrt{13}}$ (b) $\sqrt{15}$
(c) $\sqrt{13}$ (d) $\frac{1}{\sqrt{15}}$

390. If m + n = 24, then $(m - 16)^3 + (n - 8)^3$ is ______.

SSC CGL 12/09/2024 (Shift-02)

(a) 0 (b) 40
(c) 576 (d) 320

391. If $3x + 2y = 10$ and $2xy = 7$, then find the value of $3x - 2y$ (if $3x - 2y > 0$).

SSC CGL 23/09/2024 (Shift-03)

(a) 4 (b) 10
(c) 8 (d) 6

392. If $\sqrt{1+\frac{x^3}{9}} = 5$, then the value of x is equal to:

SSC Phase-XII 26/06/2024 (Shift-03)

(a) 4 (b) 8
(c) 6 (d) 9

393. If $\frac{A}{L} + \frac{M}{B} = 1$ and $\frac{B}{M} + \frac{N}{C} = 1$, then the value of $\frac{L}{A} + \frac{C}{N}$ is:

SSC CPO 03/10/2023 (Shift-02)

(a) 1 (b) $\frac{B}{M}$
(c) $\frac{M}{B}$ (d) 0

394. If $xy = 6$ and $x^2y + xy^2 + x + y = 63$, then the value of $x^2 + y^2$ is:

SSC Phase-X 02/08/2022 (Shift-02)

(a) 79 (b) 59
(c) 70 (d) 69

395. If $x^2 = b - ax$ and $x^3 (x^3 + c) = d$, then which of the following can be the values of c and d?

SSC CHSL 25/05/2022 (Shift-01)

(a) $c = a^3 - 3ab$ and $d = b^3$
(b) $c = -a^3 - 3ab$ and $d = b^3$
(c) $c = a^3 + 3ab$ and $d = b^3$
(d) $c = a^3 + 3ab$ and $d = -b^3$

396. If $3x(3x - 8) + y(y + 1) + 4z^2 - 2z + 16\frac{1}{2} = 0$, then what is the value of $(6x + y + 2z)$?

SSC PHASE-IX 2022

(a) 8 (b) $\frac{15}{2}$
(c) $\frac{7}{5}$ (d) $\frac{2}{3}$

397. For what positive value of k the equation $3x^2 + 2kx + 3 = 0$ has real and equal roots?

SSC CHSL 07/08/2023 (Shift-02)

(a) 12 (b) 1
(c) 3 (d) 9

398. For what value of p does the system of equations $18x + 36y + 45 = 0$ and $px - 54y + 67 = 0$ have no solution?

SSC Phase-XI 30/06/2023 (Shift-02)

(a) 54 (b) -27
(c) -36 (d) 27

399. If the equation $k(21x^2 + 24) + rx + (14x^2 - 9) = 0$; $k(7x^2 + 8) + px + (2x^2 - 3) = 0$; have both roots common, then the value of $\frac{p}{r}$ is

SSC CPO 11/11/2022 (Shift-03)

(a) $\frac{1}{3}$ (b) $\frac{2}{5}$
(c) $\frac{4}{3}$ (d) $\frac{7}{5}$

400. If α, β are the roots of $6x^2 + 13x + 7 = 0$, then the equation whose roots are α^2, β^2 is:

SSC CGL 12/12/2022 (Shift-04)

(a) $36x^2 - 87x + 49 = 0$
(b) $36x^2 - 85x + 49 = 0$
(c) $36x^2 - 85x - 49 = 0$
(d) $36x^2 + 87x - 49 = 0$

401. If the system of the following equations has the value of the variables as three consecutive integers, then the value of a is ____.

$x - y + z = 2a$
$x + 4y - 2z = 3(4 - a)$
$2x - 3y + 4z = 6 - 2a$

SSC CGL 18/09/2024 (Shift-01)

(a) 2 (b) 4
(c) 1 (d) 3

SPEED BOOSTER HACKS

◆ Some special results you should remember ◆

- ◆ $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
- ◆ $a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c)[3(a^2 + b^2 + c^2) - (a + b + c)^2]$
- ◆ $a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ac)]$
- ◆ $a^3 + b^3 + c^3 - 3abc = \frac{(a+b+c)}{2}[(a - b)^2 + (b - c)^2 + (c - a)^2]$

Note:- If $a^3 + b^3 + c^3 = 3abc$ then, $a + b + c = 0$ or $a = b = c$

ANSWER KEY

1.	(c)	2.	(a)	3.	(a)	4.	(c)	5.	(a)	6.	(c)	7.	(c)	8.	(a)	9.	(a)	10.	(d)
11.	(d)	12.	(c)	13.	(b)	14.	(a)	15.	(d)	16.	(a)	17.	(c)	18.	(d)	19.	(b)	20.	(a)
21.	(a)	22.	(a)	23.	(d)	24.	(a)	25.	(d)	26.	(b)	27.	(a)	28.	(b)	29.	(b)	30.	(c)
31.	(d)	32.	(d)	33.	(d)	34.	(a)	35.	(a)	36.	(c)	37.	(c)	38.	(d)	39.	(c)	40.	(d)
41.	(b)	42.	(c)	43.	(b)	44.	(b)	45.	(a)	46.	(c)	47.	(b)	48.	(b)	49.	(d)	50.	(d)
51.	(d)	52.	(b)	53.	(c)	54.	(c)	55.	(b)	56.	(d)	57.	(a)	58.	(c)	59.	(b)	60.	(c)
61.	(d)	62.	(a)	63.	(d)	64.	(a)	65.	(d)	66.	(c)	67.	(a)	68.	(d)	69.	(b)	70.	(d)
71.	(c)	72.	(c)	73.	(a)	74.	(b)	75.	(a)	76.	(a)	77.	(b)	78.	(d)	79.	(d)	80.	(a)
81.	(a)	82.	(b)	83.	(c)	84.	(a)	85.	(a)	86.	(b)	87.	(b)	88.	(a)	89.	(a)	90.	(c)
91.	(d)	92.	(a)	93.	(b)	94.	(a)	95.	(b)	96.	(b)	97.	(d)	98.	(b)	99.	(d)	100.	(d)
101.	(d)	102.	(d)	103.	(b)	104.	(b)	105.	(a)	106.	(c)	107.	(a)	108.	(b)	109.	(a)	110.	(c)
111.	(b)	112.	(d)	113.	(b)	114.	(b)	115.	(b)	116.	(b)	117.	(b)	118.	(d)	119.	(c)	120.	(b)
121.	(b)	122.	(b)	123.	(b)	124.	(b)	125.	(c)	126.	(b)	127.	(a)	128.	(c)	129.	(b)	130.	(a)
131.	(c)	132.	(c)	133.	(a)	134.	(c)	135.	(b)	136.	(d)	137.	(c)	138.	(a)	139.	(a)	140.	(b)
141.	(a)	142.	(b)	143.	(a)	144.	(c)	145.	(b)	146.	(d)	147.	(b)	148.	(a)	149.	(d)	150.	(b)
151.	(a)	152.	(d)	153.	(d)	154.	(c)	155.	(b)	156.	(b)	157.	(c)	158.	(b)	159.	(b)	160.	(d)
161.	(b)	162.	(b)	163.	(b)	164.	(d)	165.	(a)	166.	(c)	167.	(d)	168.	(d)	169.	(d)	170.	(a)
171.	(d)	172.	(d)	173.	(c)	174.	(a)	175.	(b)	176.	(d)	177.	(b)	178.	(b)	179.	(b)	180.	(b)
181.	(b)	182.	(b)	183.	(d)	184.	(c)	185.	(c)	186.	(a)	187.	(c)	188.	(c)	189.	(b)	190.	(b)
191.	(b)	192.	(c)	193.	(a)	194.	(a)	195.	(a)	196.	(c)	197.	(d)	198.	(b)	199.	(d)	200.	(c)
201.	(c)	202.	(c)	203.	(b)	204.	(c)	205.	(a)	206.	(a)	207.	(a)	208.	(c)	209.	(b)	210.	(b)
211.	(d)	212.	(a)	213.	(c)	214.	(a)	215.	(c)	216.	(b)	217.	(a)	218.	(b)	219.	(b)	220.	(a)
221.	(b)	222.	(a)	223.	(d)	224.	(d)	225.	(b)	226.	(a)	227.	(a)	228.	(b)	229.	(b)	230.	(c)
231.	(b)	232.	(d)	233.	(d)	234.	(d)	235.	(c)	236.	(a)	237.	(b)	238.	(a)	239.	(c)	240.	(d)
241.	(c)	242.	(a)	243.	(c)	244.	(d)	245.	(b)	246.	(d)	247.	(c)	248.	(c)	249.	(a)	250.	(d)
251.	(b)	252.	(b)	253.	(d)	254.	(c)	255.	(c)	256.	(b)	257.	(b)	258.	(a)	259.	(b)	260.	(c)
261.	(d)	262.	(a)	263.	(a)	264.	(b)	265.	(a)	266.	(b)	267.	(c)	268.	(d)	269.	(d)	270.	(b)
271.	(c)	272.	(d)	273.	(d)	274.	(c)	275.	(b)	276.	(b)	277.	(b)	278.	(c)	279.	(d)	280.	(d)
281.	(d)	282.	(d)	283.	(a)	284.	(d)	285.	(b)	286.	(b)	287.	(c)	288.	(a)	289.	(a)	290.	(b)
291.	(a)	292.	(c)	293.	(d)	294.	(a)	295.	(c)	296.	(c)	297.	(b)	298.	(a)	299.	(b)	300.	(a)
301.	(c)	302.	(b)	303.	(a)	304.	(a)	305.	(a)	306.	(b)	307.	(a)	308.	(a)	309.	(d)	310.	(a)
311.	(d)	312.	(b)	313.	(a)	314.	(a)	315.	(b)	316.	(d)	317.	(d)	318.	(c)	319.	(c)	320.	(a)
321.	(d)	322.	(d)	323.	(d)	324.	(d)	325.	(d)	326.	(c)	327.	(c)	328.	(c)	329.	(d)	330.	(d)
331.	(c)	332.	(a)	333.	(b)	334.	(b)	335.	(c)	336.	(a)	337.	(d)	338.	(a)	339.	(c)	340.	(a)
341.	(a)	342.	(b)	343.	(a)	344.	(d)	345.	(c)	346.	(b)	347.	(a)	348.	(d)	349.	(b)	350.	(a)
351.	(a)	352.	(b)	353.	(b)	354.	(d)	355.	(d)	356.	(a)	357.	(d)	358.	(c)	359.	(b)	360.	(a)
361.	(c)	362.	(c)	363.	(d)	364.	(b)	365.	(a)	366.	(a)	367.	(d)	368.	(d)	369.	(a)	370.	(c)
371.	(a)	372.	(b)	373.	(a)	374.	(d)	375.	(b)	376.	(c)	377.	(a)	378.	(a)	379.	(b)	380.	(a)
381.	(b)	382.	(d)	383.	(a)	384.	(d)	385.	(d)	386.	(c)	387.	(a)	388.	(d)	389.	(a)	390.	(a)
391.	(a)	392.	(c)	393.	(a)	394.	(d)	395.	(c)	396.	(a)	397.	(c)	398.	(b)	399.	(a)	400.	(b)
401.	(c)																		

SOLUTIONS

1. (c) If $a + \frac{1}{a} = k$ then $a^2 + \frac{1}{a^2} = k^2 - 2$

$\because a + \frac{1}{a} = 12$

$\Rightarrow a^2 + \frac{1}{a^2} = 12^2 - 2 = 142$

2. (a) $y + \frac{1}{y} = 8$

$y^2 + \frac{1}{y^2} = 8^2 - 2 = 62$

3. (a) $\because x + \frac{1}{x} = 15$

If $x + \frac{1}{x} = k$, then $x^2 + \frac{1}{x^2} = k^2 - 2$

$\therefore x^2 + \frac{1}{x^2} = (15)^2 - 2$

$= 225 - 2 = 223$

4. (c) $x + \frac{1}{x} = 7$

$\Rightarrow x^2 + \frac{1}{x^2} = 7^2 - 2 = 47$

5. (a) Given,

$\sqrt{x} + \frac{1}{\sqrt{x}} = 7$

$x + \frac{1}{x} = 7^2 - 2 = 49 - 2 = 47$

6. (c) $a + \frac{1}{a} = 6$

$\Rightarrow a^2 + \frac{1}{a^2} = 6^2 - 2 = 34$

$\therefore \frac{3}{4}\left(a^2 + \frac{1}{a^2}\right) = \frac{3}{4} \times 34 = 25.5$

7. (c) $z + \frac{1}{z} = 4$

$z^2 + \frac{1}{z^2} = 4^2 - 2 = 14$

$\therefore \frac{1}{2}\left(z^2 + \frac{1}{z^2}\right) = \frac{1}{2} \times 14 = 7$

8. (a) $3y + \frac{3}{y} = 8 \Rightarrow y + \frac{1}{y} = \frac{8}{3}$

If $x + \frac{1}{x} = k$, Then $x^2 + \frac{1}{x^2} = k^2 - 2$

$\Rightarrow y^2 + \frac{1}{y^2} = \frac{64}{9} - 2 = \frac{46}{9} = 5\frac{1}{9}$

9. (a) Given,

$5y + \frac{5}{y} = 11 \Rightarrow y + \frac{1}{y} = \frac{11}{5}$

$\Rightarrow y^2 + \frac{1}{y^2} = \frac{121}{25} - 2 = \frac{71}{25} = 2\frac{21}{25}$

10. (d) $\frac{1}{(x-2)} + x = 8$

$\Rightarrow \frac{1}{(x-2)} + x - 2 = 6$

$\therefore \frac{1}{(x-2)^2} + (x-2)^2 = 6^2 - 2$

$= 36 - 2 = 34$

11. (d) $a + \frac{1}{a} = 3$

$\Rightarrow a^2 + \frac{1}{a^2} = 3^2 - 2 = 7$

$\Rightarrow a^4 + \frac{1}{a^4} = 7^2 - 2 = 47$

12. (c) $a + \frac{1}{a} = 8$

$\Rightarrow a^2 + \frac{1}{a^2} = 8^2 - 2 = 62$

$\Rightarrow a^4 + \frac{1}{a^4} = (62)^2 - 2 = 3844 - 2 =$ 3842

Using unit digit

$= 4 - 2 = 2$

option (c) has unit digit 2

13. (b) $a + \frac{1}{a} = 4 \Rightarrow a^2 + \frac{1}{a^2} = 4^2 - 2 = 14$

$\Rightarrow a^4 + \frac{1}{a^4} = 14^2 - 2 = 194$

14. (a) $x + \frac{1}{x} = 13$

$x^2 + \frac{1}{x^2} = 169 - 2 = 167$

$x^4 + \frac{1}{x^4} = 167^2 - 2 = 27889 - 2$

By unit digit (7) = 27887

15. (d) $x + \frac{1}{x} = 5\sqrt{2}$

$x^2 + \frac{1}{x^2} = \left(5\sqrt{2}\right)^2 - 2 = 48$

$x^4 + \frac{1}{x^4} = (48)^2 - 2 = 2302$

16. (a) $\frac{x^2+1}{x} = 5 \Rightarrow x + \frac{1}{x} = 5$

If $x + \frac{1}{x} = k$, Then $x^2 + \frac{1}{x^2} = k^2 - 2$

$\Rightarrow x^2 + \frac{1}{x^2} = 5^2 - 2 = 23$

$\Rightarrow x^4 + \frac{1}{x^4} = 23^2 - 2 = 527$

$\therefore x^4 + \frac{1}{x^4} - 36 = 527 - 36 = 491$

17. (c) $X + \frac{1}{X} = 2K$

$\Rightarrow X^2 + \frac{1}{X^2} = 4K^2 - 2$

$\Rightarrow X^4 + \frac{1}{X^4} = (4K^2 - 2)^2 - 2$

$= 16K^4 + 4 - 16K^2 - 2$

$= 16K^4 - 16K^2 + 2$

Alternate Method:-

Put k = 1

then, $x = 1$

by option only option (c) gives the sum 2

18. (d) If $x + \frac{1}{x} = k$

then, $x^3 + \frac{1}{x^3} = k^3 - 3k$

$x + \frac{1}{x} = 7$

$\Rightarrow x^3 + \frac{1}{x^3} = (7)^3 - 3 \times 7$

$= 343 - 21 = 322$

19. (b) $x + \frac{1}{x} = 7$

If $x + \frac{1}{x} = k$, Then $x^3 + \frac{1}{x^3} = k^3 - 3k$

$\Rightarrow x^3 + \frac{1}{x^3} = 7^3 - 3 \times 7$

$= 343 - 21 = 322$

$\therefore x^6 + \frac{1}{x^6} = (322)^2 - 2$

$= 103684 - 2 = 103682$

20. (a) $y + \frac{1}{y} = \sqrt{5}$

$y^3 + \frac{1}{y^3} = (\sqrt{5})^3 - 3 \times \sqrt{5} = 2\sqrt{5}$

$\therefore y^6 + \frac{1}{y^6} = (y^3 + \frac{1}{y^3})^2 - 2$

$= (2\sqrt{5})^2 - 2 = 18$

21. (a) $x + \frac{1}{x} = (2\sqrt{2})$

$x^2 + \frac{1}{x^2} = \left(2\sqrt{2}\right)^2 - 2 = 6$

$\therefore x^6 + \frac{1}{x^6} = \left(x^2 + \frac{1}{x^2}\right)^3 - 3\left(x^2 + \frac{1}{x^2}\right)$

$= (6)^3 - 3(6) = 216 - 18 = 198$

22. (a) $a + \frac{1}{a} = 7\sqrt{3}$

$a^2 + \frac{1}{a^2} = (49 \times 3) - 2$

$= 147 - 2 = 145$

$a^6 + \frac{1}{a^6} = (145)^3 - 3 \times 145$

Using unit digit:-

$= 5 - 3 \times 5 = 0$

Option (a) 3048190 has unit digit = 0

23. (d) $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$

$\Rightarrow x + \frac{1}{x} = \left(\sqrt{6}\right)^2 - 2 = 6 - 2 = 4$

$\Rightarrow x^2 + \frac{1}{x^2} = 4^2 - 2 = 14$

$\therefore x^6 + \frac{1}{x^6} = (14)^3 - 3 \times 14$

$= 2744 - 42 = 2702$

24. (a) $a + \frac{1}{a} = 7$

$a^2 + \frac{1}{a^2} = (7)^2 - 2 = 47$

$\Rightarrow a^3 + \frac{1}{a^3} = \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right)$

$= 343 - 21 = 322$

$\therefore a^5 + \frac{1}{a^5}$

$= \left(a^2 + \frac{1}{a^2}\right)\left(a^3 + \frac{1}{a^3}\right) - \left(a + \frac{1}{a}\right)$

$= 47 \times 322 - 7$

By digital sum option (a) satisfies

$= 15127$

25. (d) $x + \frac{1}{x} = 5$

$x^2 + \frac{1}{x^2} = 25 - 2 = 23$

$x^3 + \frac{1}{x^3} = 5^3 - 3 \times 5 = 125 - 15 = 110$

$\therefore x^5 + \frac{1}{x^5} = \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

$= 23 \times 110 - 5 = 2530 - 5 = 2525$

Alternate Method:-

If $x + \frac{1}{x} = k$, then $x^5 + \frac{1}{x^5} = (k^2 - 2)$ $(k^3 - 3k) - k$

$x + \frac{1}{x} = 5$, $x^5 + \frac{1}{x^5} = 23 \times 110 - 5$

By digit sum, option (d) satisfies

26. (b) $x + \frac{1}{x} = -6$

$x^2 + \frac{1}{x^2} = 36 - 2 = 34$

$x^3 + \frac{1}{x^3} = -198$

$x^5 + \frac{1}{x^5} = \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

Using digit sum

$= 34 \times (-198) + 6$

$= -7 \times 9 + 6 = -9 + 6 = -3$

From options (ignoring the negative sign)

(b) –6726 has DS = '3' = – 6726

27. (a) $x + \frac{1}{x} = -2\sqrt{3}$, $x^2 + \frac{1}{x^2} = 10$

$x^3 + \frac{1}{x^3} = -24\sqrt{3} + 6\sqrt{3} = -18\sqrt{3}$

$\left(x^5 + \frac{1}{x^5}\right) = \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - x + \frac{1}{x}$

$= 10 \times (-18\sqrt{3}) + 2\sqrt{3} = -178\sqrt{3}$

28. (b) $x + \frac{1}{x} = 3$

$x^2 + \frac{1}{x^2} = 3^2 - 2 = 7$

$x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 18$

$x^4 + \frac{1}{x^4} = 7^2 - 2 = 47$

$x^7 + \frac{1}{x^7}$

$= \left(x^4 + \frac{1}{x^4}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

$= 47 \times 18 - 3 = 843$

SMART APPROACH:-

If $x \pm \frac{1}{x} = a$ (unit digit) then unit digit of $x^3 \pm \frac{1}{x^3}$ and $x^7 \pm \frac{1}{x^7}$ must be a.

In the given question, 843 is the only option whose unit digit is 3.

29. (b) $x + \frac{1}{x} = 6$

Consider, $\frac{3x}{2x^2 - 5x + 2} = \frac{3}{2x - 5 + \frac{2}{x}}$

$= \frac{3}{2\left(x + \frac{1}{x}\right) - 5} = \frac{3}{12 - 5} = \frac{3}{7}$

30. (c) Given, $x + \frac{1}{x} = 15$

$\therefore \frac{7x^2 - 9x + 7}{x^2 - x + 1}$

Divide and multiply by 'x'

$\frac{7x - 9 + \frac{7}{x}}{x - 1 + \frac{1}{x}} = \frac{7\left(x + \frac{1}{x}\right) - 9}{\left(x + \frac{1}{x}\right) - 1} = \frac{7 \times 15 - 9}{15 - 1}$

$= \frac{96}{14} = \frac{48}{7}$

31. (d) If $x - \frac{1}{x} = k$

then, $x^2 + \frac{1}{x^2} = k^2 + 2$

$x - \frac{1}{x} = 0.4,$

$x^2 + \frac{1}{x^2} = (0.4)^2 + 2$

$= 0.16 + 2 = 2.16$

32. (d) $4y - \frac{4}{y} = 11 \Rightarrow y - \frac{1}{y} = \frac{11}{4}$

$\therefore y^2 + \frac{1}{y^2} = \left(\frac{11}{4}\right)^2 + 2 = \frac{121}{16} + 2 = 9\frac{9}{16}$

33. (d) $3y - \frac{3}{y} = 5 \Rightarrow y - \frac{1}{y} = \frac{5}{3}$

$\Rightarrow y^2 + \frac{1}{y^2} = a^2 + 2$

$\Rightarrow y^2 + \frac{1}{y^2} = \frac{25}{9} + 2 = \frac{43}{9}$

34. (a) $5\left(x - \frac{1}{x}\right) = -6 \Rightarrow x - \frac{1}{x} = -\frac{6}{5}$

$\Rightarrow x^2 + \frac{1}{x^2} = \left(x - \frac{1}{x}\right)^2 + 2$

$= \frac{36}{25} + 2 = \frac{86}{25}$

35. (a) $\because x - \frac{1}{x - 1} = 3$

$\Rightarrow (x - 1) - \frac{1}{(x - 1)} = 3 - 1 = 2$

$\Rightarrow (x - 1)^2 + \frac{1}{(x - 1)^2} = 4 + 2 = 6$

36. (c) $3t - \frac{1}{3t} = 3$

$\Rightarrow \left(3t - \frac{1}{3t}\right)^2 = (3)^2$

$\Rightarrow 9t^2 + \frac{1}{9t^2} - 2 \times 3t \times \frac{1}{3t} = 9$

$\Rightarrow 9t^2 + \frac{1}{9t^2} = 11$

$\therefore$ option (c) $\Rightarrow 9t^2 + \frac{1}{9t^2} + 1 = 12$

37. (c) $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$

If $x - \frac{1}{x} = k$, then $x^2 + \frac{1}{x^2} = k^2 + 2$

$\Rightarrow x + \frac{1}{x} = 4^2 + 2 = 18$

If $x + \frac{1}{x} = k$, then $x^2 + \frac{1}{x^2} = k^2 - 2$

$\Rightarrow x^2 + \frac{1}{x^2} = 18^2 - 2 = 322$

38. (d) $x\left(5 - \frac{2}{x}\right) = \frac{5}{x} \Rightarrow 5x - 2 = \frac{5}{x}$

$\Rightarrow 5x - \frac{5}{x} = 2 \Rightarrow x - \frac{1}{x} = \frac{2}{5}$

If $x - \frac{1}{x} = k$ Then, $x^2 + \frac{1}{x^2} = k^2 + 2$

$x^2 + \frac{1}{x^2} = \frac{4}{25} + 2 = \frac{54}{25}$

39. (c) $p - \frac{1}{p} = 6$

$\Rightarrow p^2 + \frac{1}{p^2} = \left(p - \frac{1}{p}\right)^2 + 2 = 38$

$\Rightarrow p^4 + \frac{1}{p^4} = 1444 - 2 = 1442$

40. (d) $x - \frac{1}{x} = 13$

$\Rightarrow x^2 + \frac{1}{x^2} = 13^2 + 2 = 171$

$\Rightarrow x^4 + \frac{1}{x^4} = 171^2 - 2 = 29239$

$= 171^2 - 2$

Using unit digit

$= 1 - 2 = 9$

Option (d) 29239 is correct.

41. (b) $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$

$\Rightarrow \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = \left(\sqrt{3}\right)^2$

$\Rightarrow x + \frac{1}{x} - 2\sqrt{x}.\frac{1}{\sqrt{x}} = 3$

$\Rightarrow x + \frac{1}{x} = 5$

$\Rightarrow x^2 + \frac{1}{x^2} = 25 - 2 = 23$

$\therefore x^4 + \frac{1}{x^4} = 23^2 - 2 = 529 - 2 = 527$

42. (c) $x - \frac{1}{x} = 1$

$x^2 + \frac{1}{x^2} = 1 + 2 = 3$

$x^4 + \frac{1}{x^4} = 3^2 - 2 = 7$

$x^8 + \frac{1}{x^8} = 7^2 - 2 = 47$

43. (b) $\left(y - \frac{1}{y}\right) = 9$

If $x - \frac{1}{x} = k$, Then $x^3 - \frac{1}{x^3} = k^3 + 3k$

$y^3 - \frac{1}{y^3} = 9^3 + 3 \times 9$

$= 729 + 27 = 756$

44. (b) $x - \frac{1}{x} = \frac{7}{3}$

$x^3 - \frac{1}{x^3} = \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$

$= \left(\frac{7}{3}\right)^3 + 3 \times \frac{7}{3} = \frac{343}{27} + 7$

$= \frac{343 + 189}{27} = \frac{532}{27} = 19\frac{19}{27}$

45. (a) $7a - \frac{7}{a} = -4$

$\Rightarrow a - \frac{1}{a} = -\frac{4}{7}$

$\Rightarrow a^3 - \frac{1}{a^3} = \frac{-64}{343} - \frac{12}{7} = \frac{-652}{343}$

$\therefore a^3 - \frac{1}{a^3} - 1 = \frac{-652}{343} - 1 = \frac{-995}{343}$

46. (c) $x - \frac{1}{x-2} = 7$

$\Rightarrow x - 2 - \frac{1}{x-2} = 7 - 2$

$\Rightarrow (x-2) - \frac{1}{(x-2)} = 5$

$\Rightarrow (x-2)^3 - \frac{1}{(x-2)^3} = 5^3 + 3 \times 5$

$= 125 + 15 = 140$

47. (b) Given,

$s - \frac{1}{s-8} = 20$

$\Rightarrow (s-8) - \frac{1}{(s-8)} = (20 - 8) = 12$

$\therefore (s-8)^3 - \frac{1}{(s-8)^3}$

$= 12^3 + 3 \times 12 = 1728 + 36 = 1764$

48. (b) $\frac{x^2 - 1}{x} = 8 \Rightarrow x - \frac{1}{x} = 8$

$\therefore \frac{x^6 - 1}{x^3} = x^3 - \frac{1}{x^3} = (8)^3 + 3 \times 8$

$= 512 + 24 = 536$

49. (d) $y - \frac{1}{y} = 4$

$y^2 + \frac{1}{y^2} = 4^2 + 2 = 18$

$y^6 + \frac{1}{y^6} = 18^3 - 3 \times 18$

$= 18 \times 321 = 5778$

By unit digit (8)

option (d) is correct

50. (d) $x - \frac{1}{x} = 4 \Rightarrow x^2 + \frac{1}{x^2} = 4^2 + 2 = 18$

$x^6 + \frac{1}{x^6} = 18^3 - 3 \times 18 = 18^3 - 54$

By unit digit, 2 − 4 = 8

Hence option (d) is correct.

Alternate Method:

$x - \frac{1}{x} = 4$

$\Rightarrow x^3 - \frac{1}{x^3} = (4)^3 + 3 \times 4 = 76$

$\therefore x^6 + \frac{1}{x^6} = (76)^2 + 2$

$= 5576 + 2 = 5778$

Note:- It can be done with the help of unit digit.

51. (d) $x - \frac{1}{x} = 2\sqrt{2}$

$x^2 + \frac{1}{x^2} = \left(2\sqrt{2}\right)^2 + 2 = 10$

$x^6 + \frac{1}{x^6} = 10^3 - 3 \times 10 = 970$

52. (b) $\frac{2p}{p^2 - 5p + 1} = \frac{1}{10}$

$\Rightarrow \frac{2}{p - 5 + \frac{1}{p}} = \frac{1}{10} \Rightarrow 20 = p + \frac{1}{p} - 5$

$\Rightarrow 25 = p + \frac{1}{p}$

53. (c) $\frac{8r}{r^2 - 8r + 1} = \frac{1}{14}$

$\Rightarrow 14 \times 8r = r^2 - 8r + 1$

$\Rightarrow 112r = r^2 - 8r + 1$

$\Rightarrow 112 = r - 8 + \frac{1}{r}$

$\Rightarrow r + \frac{1}{r} = 120$

54. (c) Given, $x + \frac{2}{x} = 1$

$\frac{x^2 + 7x + 2}{x^2 + 13x + 2}$

Divide by x

$\frac{x + \frac{2}{x} + 7}{x + \frac{2}{x} + 13} = \frac{8}{14} = \frac{4}{7}$

Alternate Method:

$x + \frac{2}{x} = 1$

Then, $x^2 + 2 = x$

$\therefore \frac{x^2 + 2 + 7x}{x^2 + 2 + 13x} = \frac{x + 7x}{x + 13x} = \frac{8}{14} = \frac{4}{7}$

55. (b) $b^2 - 4b - 1 = 0$

Divided by b

$\Rightarrow b - 4 - \frac{1}{b} = 0 \Rightarrow b - \frac{1}{b} = 4$

$b^2 + \frac{1}{b^2} = 4^2 + 2 = 18$

$\therefore b^2 + \frac{1}{b^2} + 3b - \frac{3}{b}$

$= b^2 + \frac{1}{b^2} + 3\left(b - \frac{1}{b}\right) = 18 + 3 \times 4$

$= 18 + 12 = 30$

56. (d) $x + \frac{1}{x} = 5, x \neq 0$

Divided by x in the numerator an

denominator of $\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1}$

Now,

$\frac{\frac{1}{x}\left(x^4 + \frac{1}{x^2}\right)}{\frac{1}{x}(x^2 - 3x + 1)} = \frac{x^3 + \frac{1}{x^3}}{x - 3 + \frac{1}{x}}$

$= \frac{(5)^3 - 3 \times (5)}{5 - 3} = \frac{110}{2} = 55$

57. (a) $x^2 - 3x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = 3$

$x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 18$

$\therefore \frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x} + 5} = \frac{18}{3 + 5} = \frac{18}{8} = \frac{9}{4}$

58. (c) $a^2 - 4a + 1 = 0$

$\Rightarrow a - 4 + \frac{1}{a} = 0$

$\Rightarrow a + \frac{1}{a} = 4$

$\Rightarrow a^2 + \frac{1}{a^2} = \left(a + \frac{1}{a}\right)^2 - 2$

$= 4^2 - 2 = 14$

$\therefore a^2 + \frac{1}{a^2} + a + \frac{1}{a} = 14 + 4 = 18$

59. (b) $x^2 - 3x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = 3 \Rightarrow x^2 + \frac{1}{x^2} = 3^2 - 2 = 7$

$\Rightarrow x^4 + \frac{1}{x^4} = 7^2 - 2 = 47$

$\therefore \frac{\left(x^5 + \frac{1}{x^3}\right)}{x^2 + 1}$

Divided by x in N^r and D^r, we get

$\frac{x^4 + \frac{1}{x^4}}{x + \frac{1}{x}} = \frac{47}{3}$

60. (c) $x^2 - 3x - 1 = 0$

$\Rightarrow x - \frac{1}{x} = 3$

If $x - \frac{1}{x} = k$, then $x^2 + \frac{1}{x^2} = k^2 + 2$

$\therefore (x^2 + 8x - 1)\left(x^3 + \frac{1}{x}\right)^{-1}$

$= \frac{x\left[x - \frac{1}{x} + 8\right]}{x\left[x^2 + \frac{1}{x^2}\right]} = \frac{3 + 8}{11} = \frac{11}{11} = 1$

61. (d) $x^2 - 4x - 1 = 0$

$\Rightarrow x - \frac{1}{x} = 4 \Rightarrow x^2 + \frac{1}{x^2} = 4^2 + 2 = 18$

$\therefore x^2 + \frac{1}{x^2} - 5 = 18 - 5 = 13$

62. (a) $x^2 - 6x - 1 = 0$

On dividing both side by x

$\Rightarrow x - \frac{1}{x} = 6$

On squaring both side,

$x^2 + \frac{1}{x^2} = 36 + 2 = 38$

$\therefore x^2 + \frac{1}{x^2} - 8 = 38 - 8 = 30$

63. (d) $p^2 - 4p - 1 = 0$,

$\Rightarrow p - \frac{1}{p} = 4$

$\Rightarrow p^2 + \frac{1}{p^2} = 4^2 + 2 = 18$

$\therefore p^2 + \frac{1}{p^2} + 3\left(p - \frac{1}{p}\right)$

$= 18 + 3 \times 4 = 18 + 12 = 30$

64. (a) $x - \frac{1}{x} = 5$

$x^3 - \frac{1}{x^3} = 5^3 + 3 \times 5$

$= 125 + 15 = 140$

$\therefore \frac{x^6 + 3x^3 - 1}{x^6 - 8x^3 - 1}$

Dividing by x^3 in N^r & D^r, we get

$\frac{x^3 + 3 - \frac{1}{x^3}}{x^3 - 8 - \frac{1}{x^3}} = \frac{x^3 - \frac{1}{x^3} + 3}{x^3 - \frac{1}{x^3} - 8}$

$= \frac{140 + 3}{140 - 8} = \frac{143}{132} = \frac{13}{12}$

65. (d) $5x^2 + 7x + 5 = 0$

Divide by x on both side

$5x + 7 + \frac{5}{x} = 0 \Rightarrow x + \frac{1}{x} = \frac{-7}{5}$

$\therefore x^3 + \frac{1}{x^3} = \frac{-343}{125} + \frac{21}{5} = \frac{182}{125}$

66. (c) $7x^2 + 5x + 7 = 0$

Divide by $7x$,

$x + \frac{5}{7} + \frac{1}{x} = 0 \Rightarrow x + \frac{1}{x} = \frac{-5}{7}$

$x^3 + \frac{1}{x^3} = \left(\frac{-5}{7}\right)^3 - 3\left(\frac{-5}{7}\right)$

$= \frac{-125}{343} + \frac{15}{7} = \frac{-125 + 735}{343} = \frac{610}{343}$

67. (a) Given,

$\frac{x}{x^2 - 2x + 1} = \frac{1}{3}$

$\Rightarrow \frac{1}{x - 2 + \frac{1}{x}} = \frac{1}{3} \quad \Rightarrow x + \frac{1}{x} = 5$

$\therefore x^3 + \frac{1}{x^3} = 5^3 - 3 \times 5$

$= 125 - 15 = 110$

68. (d) $2x + \frac{2}{x} = 5$ or $x + \frac{1}{x} = \frac{5}{2}$

If $x + \frac{1}{x} = k$, Then $x^3 + \frac{1}{x^3} = k^3 - 3k$

$\Rightarrow x^3 + \frac{1}{x^3} = \left(\frac{5}{2}\right)^3 - 3 \times \frac{5}{2} = \frac{65}{8}$

$\therefore \left(x^3 + \frac{1}{x^3} + 2\right) = \frac{65}{8} + 2 = \frac{81}{8}$

69. (b) $K + \frac{1}{K} = -3$

$\Rightarrow K^2 + \frac{1}{K^2} = N^2 - 2 = (-3)^2 - 2 = 7$

$\Rightarrow K^3 + \frac{1}{K^3} = (-3)^3 - 3 \times (-3) = -18$

$\therefore \left(\frac{K^6 + 1}{K^3}\right) + \left(\frac{K^4 + 1}{K^2}\right)$

$= \left(K^3 + \frac{1}{K^3}\right) + \left(K^2 + \frac{1}{K^2}\right)$

$= (-18 + 7) = -11$

70. (d) $\frac{K}{K^2 - 2K + 1} = \frac{1}{6} \Rightarrow \frac{K^2 - 2K + 1}{K} = 6$

$\Rightarrow K + \frac{1}{K} - 2 = 6 \Rightarrow K + \frac{1}{K} = 8$

$\therefore K^3 + \frac{1}{K^3} = 8^3 - 3 \times 8 = 512 - 24 = 488$

71. (c) $x^2 - 5x + 1 = 0$

$\Rightarrow x - 5 + \frac{1}{x} = 0 \Rightarrow x + \frac{1}{x} = 5$

$\Rightarrow x^3 + \frac{1}{x^3} = 5^3 - 3 \times 5 = 110$

$\therefore \frac{x^6 + x^4 + x^2 + 1}{5x^3} = \frac{1}{5}\left[x^3 + x + \frac{1}{x} + \frac{1}{x^3}\right]$

$= \frac{1}{5}\left[\left(x + \frac{1}{x}\right) + \left(x^3 + \frac{1}{x^3}\right)\right]$

$= \frac{1}{5}[5 + 110] = 23$

72. (c) $4x^2 - 6x + 1 = 0$

$\Rightarrow 2x - 3 + \frac{1}{2x} = 0 \Rightarrow 2x + \frac{1}{2x} = 3$

$8x^3 + \frac{1}{8x^3} = (3)^3 - 3 \times 3 = 27 - 9 = 18$

73. (a) $x^2 - \sqrt{7}x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = \sqrt{7}$

$x^2 + \frac{1}{x^2} = 5$

$x^3 + \frac{1}{x^3} = 7\sqrt{7} - 3\sqrt{7} = 4\sqrt{7}$

$\therefore x^5 + \frac{1}{x^5} = \left(x^3 + \frac{1}{x^3}\right)\left(x^2 + \frac{1}{x^2}\right) - \left(x + \frac{1}{x}\right)$

$= 4\sqrt{7} \times 5 - \sqrt{7} = 19\sqrt{7}$

74. (b) $x^2 + 3x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = -3$

$x^3 + \frac{1}{x^3} = (-3)^3 - 3(-3) = -27 + 9 = -18$

$x^6 + \frac{1}{x^6} = (-18)^2 - 2 = 324 - 2 = 322$

75. (a) $x^2 - 3x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = 3$

$\Rightarrow x^2 + \frac{1}{x^2} = 9 - 2 = 7$

$\Rightarrow x^4 + \frac{1}{x^4} = 7^2 - 2 = 47$

$\Rightarrow x^8 + \frac{1}{x^8} = 47^2 - 2 = 2207$

$\therefore 2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right)$

$\Rightarrow 2 \times 2207 - 5 \times 7$

$= 4414 - 35 = 4379$

76. (a) $x^2 + \frac{1}{x^2} = 119$

then $x + \frac{1}{x} = \sqrt{119 + 2}$

$x + \frac{1}{x} = \sqrt{121} = 11$

$x^3 + \frac{1}{x^3} = (11)^3 - 3 \times 11$

$= 1331 - 33 = 1298$

77. (b) $x^2 + \frac{1}{x^2} = 7$

$\Rightarrow x + \frac{1}{x} = \sqrt{7 + 2} = 3$

$\therefore x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 18$

78. (d) $\left(p^2 + \frac{1}{p^2}\right) = 14$

$\Rightarrow p + \frac{1}{p} = \sqrt{14 + 2} = 4$

$\therefore p^3 + \frac{1}{p^3} = N^3 - 3N = (4)^3 - 3 \times 4$

$= 64 - 12 = 52$

79. (d) $x^2 + \frac{1}{x^2} = 7$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 7 + 2$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 9 \Rightarrow x + \frac{1}{x} = 3$

$\therefore x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 27 - 9 = 18$

80. (a) $\frac{x^2}{y^2} + \frac{y^2}{x^2} = 7$

Let, $\frac{x}{y} = a \Rightarrow a^2 + \frac{1}{a^2} = 7$

$\therefore a + \frac{1}{a} = \sqrt{\left(a^2 + \frac{1}{a^2}\right) + 2} = \sqrt{7 + 2} = 3$

$\therefore a^3 + \frac{1}{a^3} = \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right)$

$= 3^3 - 3 \times 3 = 18$

81. (a) Given, $x^4 + \frac{1}{x^4} = 7$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{7+2} = 3 \Rightarrow x^2 + \frac{1}{x^2} = 3$

$\therefore\ x^2 + \frac{1}{x^2} - 2 = 3 -$

82. (b) $16x^4 + \frac{1}{16x^4} = 1\quad 9$

$\Rightarrow 4x^2 + \frac{1}{4x^2} = \sqrt{14159+2} = \sqrt{14161}$

$\begin{bmatrix} x^2 + \frac{1}{x^2} = n \\ x + \frac{1}{x} = \sqrt{n+2} \end{bmatrix}$

$\Rightarrow 4x^2 + \frac{1}{4x^2} = 119$

$\Rightarrow 2x + \frac{1}{2x} = \sqrt{119+2}$

$\Rightarrow 2x + \frac{1}{2x} = 11$

83. (c) $x^4 + \frac{1}{x^4} = 194$

$x^2 + \frac{1}{x^2} = \sqrt{194+2} = 14$

$x + \frac{1}{x} = \sqrt{14+2} = 4$

$x^3 + \frac{1}{x^3} + \frac{1}{x} + x = \left(x^2 + \frac{1}{x^2}\right)\left(x + \frac{1}{x}\right)$

$= 14 \times 4 = 56$

84. (a) $x^4 + \frac{1}{x^4} = 254$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{254+2} = 16$

$\Rightarrow x + \frac{1}{x} = \sqrt{16+2} = 3\sqrt{2}$

$\Rightarrow x^3 + \frac{1}{x^3} = a^3 - 3a$

$= \left(3\sqrt{2}\right)^3 - 3 \times 3\sqrt{2}$

$= 54\sqrt{2} - 9\sqrt{2} = 45\sqrt{2}$

$\therefore x^5 + \frac{1}{x^5} = \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

$= 16 \times 45\sqrt{2} - 3\sqrt{2} = 717\sqrt{2}$

85. (a) If $x > 0$, $x^4 + \frac{1}{x^4} = 142$,

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{142+2} = 12$

$\Rightarrow x + \frac{1}{x} = \sqrt{12+2} = \sqrt{14}$

$\Rightarrow x^3 + \frac{1}{x^3} = 14\sqrt{14} - 3\sqrt{14} = 11\sqrt{14}$

$\therefore x^7 + \frac{1}{x^7} = \left(x^4 + \frac{1}{x^4}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

$= 142 \times 11\sqrt{14} - \sqrt{14}$

$= 1562\sqrt{14} - \sqrt{14} = 1561\sqrt{14}$

86. (b) $k^4 + \frac{1}{k^4} = 194$

$k^2 + \frac{1}{k^2} = \sqrt{194+2} = 14$

$k + \frac{1}{k} = \sqrt{14+2} = 4$

$\therefore k^3 + \frac{1}{k^3} = 4^3 - 12 = 52$

87. (b) $x^4 + \left(\frac{2}{x}\right)^4 = 15617$

$\therefore x^2 + \left(\frac{2}{x}\right)^2 = \sqrt{15617+8}$

$= \sqrt{15625} = 125$

$\Rightarrow x + \frac{2}{x} = \sqrt{125+4} = \sqrt{129}$

88. (a) $x^8 - 433x^4 + 16 = 0$

Divided by x^4

$\Rightarrow x^4 + \frac{16}{x^4} = 433$

$\Rightarrow x^2 + \left(\frac{2}{x}\right)^2 = \sqrt{433+8}$

$= \sqrt{441} = 21$

$x + \frac{2}{x} = \sqrt{21+4} = \sqrt{25} = 5$

89. (a) $x^4 + \frac{1}{x^4} = 47$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{47+2} = 7$

$\Rightarrow x + \frac{1}{x} = \sqrt{7+2} = 3$

$\therefore x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 18$

90. (c) $a^4 + \frac{1}{a^4} = 194$

$a^2 + \frac{1}{a^2} = \sqrt{194+2} = 14$

$a + \frac{1}{a} = \sqrt{14+2} = 4$

$\therefore \frac{a^6+1}{a^3} = a^3 + \frac{1}{a^3} = 4^3 - 3 \times 4$

$= 64 - 12 = 52$

91. (d) Given, $x^4 + \frac{1}{x^4} = 1154$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{1154+2} = \sqrt{1156} = 34$

Similarly,

$x + \frac{1}{x} = \sqrt{34+2} = 6$

$\therefore x^3 + \frac{1}{x^3} = (6)^3 - 3 \times 6 = 198$

92. (a) $a^4 + \frac{1}{a^4} = 50$

$a^4 + \frac{1}{a^4} + 2 = 50 + 2$

$\left(a^2 + \frac{1}{a^2}\right)^2 = 52 \Rightarrow a^2 + \frac{1}{a^2} = 2\sqrt{13}$

$a^2 + \frac{1}{a^2} + 2 = 2\sqrt{13} + 2$

$\left(a + \frac{1}{a}\right)^2 = 2(\sqrt{13} + 1)$

$a + \frac{1}{a} = \sqrt{2\left(\sqrt{13}+1\right)}$

$a^3 + \frac{1}{a^3} = \left(\sqrt{2\left(\sqrt{13}+1\right)}\right)^3 - 3\left(\sqrt{2\left(\sqrt{13}+1\right)}\right)$

$= 2\left(\sqrt{13}+1\right)\left(\sqrt{2\left(\sqrt{13}+1\right)}\right) - 3\left(\sqrt{2\left(\sqrt{13}+1\right)}\right)$

$= \sqrt{2(\sqrt{13}+1)}\ [2\sqrt{13} + 2 - 3]$

$= \sqrt{2(\sqrt{13}+1)}\ [2\sqrt{13} - 1]$

93. (b) $x^4 + \frac{1}{x^4} = 2207$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{2207+2} = \sqrt{2209} = 47$

$\Rightarrow x + \frac{1}{x} = \sqrt{47+2} = 7$

$\Rightarrow x^3 + \frac{1}{x^3} = 7^3 - 3 \times 7 = 322$

$\therefore x^7 + \frac{1}{x^7} = \left(x^3 + \frac{1}{x^3}\right)\left(x^4 + \frac{1}{x^4}\right) - \left(x + \frac{1}{x}\right)$

$= 322 \times 2207 - 7$

Using unit dgiit

$= 2 \times 7 - 7$

$= 14 - 7 = 7$

Hence, (b) is correct

94. (a) $x^8 - 34x^4 + 1 = 0$

$\Rightarrow x^4 + \frac{1}{x^4} = 34$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{34+2} = 6$

$\left(x^2\right)^3 + \frac{1}{\left(x^2\right)^3} = \left(x^2 + \frac{1}{x^2}\right)^3 - 3\left(x^2 + \frac{1}{x^2}\right)$

$= (6^3 - 3 \times 6) = 198$

95. (b) $x^2 + \frac{1}{x^2} = 29$

$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 29 - 2$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 27 \Rightarrow x - \frac{1}{x} = \pm 3\sqrt{3}$

96. (b) $x^2 + \frac{1}{x^2} = 18$

$\Rightarrow x - \frac{1}{x} = \sqrt{18-2} = 4$

$\therefore x^3 - \frac{1}{x^3} = 4^3 + 3 \times 4 = 64 + 12 = 76$

97. (d) $x^2 + \frac{1}{x^2} = 83$

$x - \frac{1}{x} = \sqrt{83-2} = 9$

If $x - \frac{1}{x} = k$ then $x^3 - \frac{1}{x^3} = k^3 + 3k$

$\therefore x^3 - \frac{1}{x^3} = 9^3 + 3 \times 9 = 729 + 27$

$= 756$

98. (b) $a^2 + \frac{1}{a^2} = \frac{7}{3}$

$a - \frac{1}{a} = \sqrt{\frac{7}{3} - 2} = \frac{1}{\sqrt{3}}$

$a^3 - \frac{1}{a^3} = \frac{1}{3\sqrt{3}} + \frac{3 \times 1}{\sqrt{3}} = \frac{10}{3\sqrt{3}}$

99. (d) $x^4 + \frac{1}{x^4} = 727$

$x^2 + \frac{1}{x^2} = \sqrt{727+2} = \sqrt{729} = 27$

$x - \frac{1}{x} = \sqrt{27-2} = \sqrt{25} = 5$

100. (d) $x^4 + \frac{1}{x^4} = 79$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{81} = 9$

$\Rightarrow x - \frac{1}{x} = \sqrt{9-2} = \sqrt{7}$

101. (d) $x^8 - 1442x^4 + 1 = 0$

$\Rightarrow x^4 - 1442 + \frac{1}{x^4} = 0$

$\Rightarrow x^4 + \frac{1}{x^4} = 1442$

$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 1442 + 2$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 1444 \Rightarrow x^2 + \frac{1}{x^2} = 38$

$x^2 + \frac{1}{x^2} - 2 = 38 - 2$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 36 \Rightarrow x - \frac{1}{x} = 6$

102. (d) $x^8 - 2599x^4 + 1 = 0$

$\Rightarrow \quad x^4 + \frac{1}{x^4} = 2599$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{2599+2} = \sqrt{2601} = 51$

$\Rightarrow x - \frac{1}{x} = \sqrt{51-2} = 7$

103. (b) $x^4 - 83x^2 + 1 = 0$

$\Rightarrow x^2 + \frac{1}{x^2} = 83$

$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 83 - 2$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 81 \Rightarrow x - \frac{1}{x} = 9$

$\therefore x^3 - \frac{1}{x^3} = (9)^3 + 3 \times 9 = 756$

104. (b) $x^8 - 34x^4 + 1 = 0$

$\Rightarrow x^4 - 34 + \frac{1}{x^4} = 0$

$\Rightarrow x^4 + \frac{1}{x^4} = 34$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{34+2} = 6$

$x^2 + \frac{1}{x^2} - 2 = 6 - 2 = 4$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = (2)^2 \Rightarrow x - \frac{1}{x} = 2$

$\therefore x^3 - \frac{1}{x^3} = 2^3 + 3 \times 2 = 14$

105. (a) $x^4 - 62x^2 + 1 = 0$

$\Rightarrow x^2 - 62 + \frac{1}{x^2} = 0$

$\Rightarrow x^2 + \frac{1}{x^2} = 62$

$\Rightarrow x + \frac{1}{x} = \sqrt{62+2} = 8$

$\therefore x^3 + \frac{1}{x^3} = 8^3 - 8 \times 3$

$= 512 - 24 = 488$

106. (c) $x + \frac{1}{x} = 7$

$x + \frac{1}{x} = a \Rightarrow x - \frac{1}{x} = \sqrt{a^2 - 4}$

$\Rightarrow x - \frac{1}{x} = \sqrt{7^2 - 4} = \sqrt{45} = 3\sqrt{5}$

107. (a) $\left(w + \frac{1}{w}\right) = 6$

$w - \frac{1}{w} = \sqrt{6^2 - 4} = \sqrt{32} = 4\sqrt{2}$

108. (b) $x + \frac{1}{x} = \frac{65}{8}$

If $x + \frac{1}{x} = k$ then, $x - \frac{1}{x} = \sqrt{k^2 - 4}$

$\therefore x - \frac{1}{x} = \sqrt{\left(\frac{65}{8}\right)^2 - 4} = \sqrt{\frac{4225}{64} - 4}$

$= \sqrt{\frac{4225 - 256}{64}} = \sqrt{\frac{3969}{64}} = \frac{63}{8}$

109. (a) $x + \frac{1}{2x} = \frac{-5}{2}$

$x - \frac{1}{2x} = \sqrt{\left(\frac{-5}{2}\right)^2 - 4 \times \frac{1}{2}} = \frac{\sqrt{17}}{2}$

110. (c) $a - \frac{1}{a} = 4$, If $x - \frac{1}{x} = k$

Then, $x + \frac{1}{x} = \sqrt{k^2 + 4}$

$a + \frac{1}{a} = \sqrt{16+4} = \sqrt{20} = 2\sqrt{5}$

111. (b) $x = \frac{1}{x-5} \Rightarrow x - 5 = \frac{1}{x}$

$\Rightarrow x - \frac{1}{x} = 5 \Rightarrow x + \frac{1}{x} = \sqrt{(5)^2 + 4} = \sqrt{29}$

112. (d) $(x-3) = \frac{1}{x} \Rightarrow x - \frac{1}{x} = 3$

$\Rightarrow x + \frac{1}{x} = \sqrt{3^2 + 4} = \sqrt{13}$

113. (b) $a = \frac{1}{a - \sqrt{6}}$

$\Rightarrow a - \sqrt{6} = \frac{1}{a} \Rightarrow a - \frac{1}{a} = \sqrt{6}$

$\Rightarrow a + \frac{1}{a} = \sqrt{(\sqrt{6})^2 + 4} = \sqrt{10}$

114. (b) $x + \frac{1}{x} = -14$

$x - \frac{1}{x} = \sqrt{(-14)^2 - 4} = \sqrt{192} = \pm 8\sqrt{3}$

We take $-8\sqrt{3}$ because $x < -1$,

$\therefore x^2 - \frac{1}{x^2} = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

$= (-14) \times (-8\sqrt{3}) = 112\sqrt{3}$

115. (b) $\left(x - \frac{1}{x}\right)^2 = 12 \Rightarrow x - \frac{1}{x} = 2\sqrt{3}$

$x + \frac{1}{x} = \sqrt{12+4} = \sqrt{16} = 4$

$\therefore x^2 - \frac{1}{x^2} = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

$= 4 \times 2\sqrt{3} = 8\sqrt{3}$

116. (b) $x^2 - 7x + 1 = 0 \Rightarrow x + \frac{1}{x} = 7$

$\therefore x - \frac{1}{x} = \sqrt{(7)^2 - 4}\ z$

$= \sqrt{49 - 4} = \pm 3\sqrt{5}$ $(\because 0 < x < 1)$

$\because x^2 - \frac{1}{x^2} = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

$= 7 \times -3\sqrt{5} = -21\sqrt{5}$

117. (b) $x^2 - 3.2x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = 3.2$

If $x + \frac{1}{x} = k$, Then $x - \frac{1}{x} = \sqrt{k^2 - 4}$

$\Rightarrow x - \frac{1}{x} = \sqrt{3.2^2 - 2^2}$

$= \sqrt{5.2 \times 1.2} = 4\sqrt{0.39}$

$\therefore x^2 - \frac{1}{x^2} = \left(x - \frac{1}{x}\right)\left(x + \frac{1}{x}\right)$

$= 4\sqrt{0.39} \times 3.2 = 12.8\sqrt{0.39}$

118. (d) Given,

$\left(x^2 + \frac{1}{x^2}\right) = 7 \Rightarrow x + \frac{1}{x} = 3$

$\Rightarrow x - \frac{1}{x} = \pm\sqrt{5}$ $[0 < x < 1]$

$\therefore x^2 - \frac{1}{x^2} = \left[x + \frac{1}{x}\right]\left[x - \frac{1}{x}\right]$

$= 3 \times (-\sqrt{5}) = (-3\sqrt{5})$

Alternate Method:

$x^2 + \frac{1}{x^2} = 7$

$x^2 - \frac{1}{x^2} = \sqrt{\left(x^2 + \frac{1}{x^2}\right)^2 - 4}$

$= \sqrt{49 - 4} = \sqrt{45} = -3\sqrt{5}$

Note:- Here we took (–) because $0 < x < 1$

119. (c) $x^2 + \frac{1}{x^2} = 2\sqrt{5}$

$x^2 - \frac{1}{x^2} = \sqrt{(2\sqrt{5})^2 - 4} = 4$

$\therefore x^4 - \frac{1}{x^4} = \left(x^2 + \frac{1}{x^2}\right)\left(x^2 - \frac{1}{x^2}\right)$

$= 2\sqrt{5} \times 4 = 8\sqrt{5}$

120. (b) $\frac{6x}{2x^2+5x-2}=1$

$\Rightarrow 6x=2x^2+5x-2$

$\Rightarrow x=2x^2-2\Rightarrow x-\frac{1}{x}=\frac{1}{2}$

If $x-\frac{1}{x}=k$, then $x+\frac{1}{x}$

$=\sqrt{k^2+4}$

$x+\frac{1}{x}=\sqrt{\left(\frac{1}{2}\right)^2+4}=\frac{\sqrt{17}}{2}$

If $x+\frac{1}{x}=k$,

then $x^3+\frac{1}{x^3}=k^3-3k$

$x^3+\frac{1}{x^3}=\left(\frac{\sqrt{17}}{2}\right)^3-3\times\frac{\sqrt{17}}{2}$

$=\frac{17\sqrt{17}}{8}-\frac{3\sqrt{17}}{2}=\frac{5\sqrt{17}}{8}$

121. (b) $\left(x+\frac{1}{x}\right)=7$

$\Rightarrow x-\frac{1}{x}=\sqrt{49-4}=\sqrt{45}$

$\therefore x^3-\frac{1}{x^3}=45\sqrt{45}+3\sqrt{45}$

$=48\sqrt{45}=144\sqrt{5}$

122. (b) $y+\frac{1}{y}=11\Rightarrow y-\frac{1}{y}=\sqrt{121-4}$

$=\sqrt{117}=3\sqrt{13}$

$\therefore y^3-\frac{1}{y^3}=\left(3\sqrt{13}\right)^3+3\times3\sqrt{13}$

$=351\sqrt{13}+9\sqrt{13}=360\sqrt{13}$

123. (b) If $x+\frac{1}{x}=a$ then,

$x-\frac{1}{x}=\sqrt{a^2-4}$

$x+\frac{1}{x}=2\sqrt{10}$

$x-\frac{1}{x}=\sqrt{(2\sqrt{10})^2-4}=6$

$x^3-\frac{1}{x^3}=(6)^3+3(6)=216+18$

$=234$

124. (b) $x^2-5\sqrt{5}\,x+1=0$

$\Rightarrow x+\frac{1}{x}=5\sqrt{5}$

$\Rightarrow x-\frac{1}{x}=\sqrt{(5\sqrt{5})^2-4}=\sqrt{125-4}=11$

$\therefore x^3-\frac{1}{x^3}=(11)^3+3\times11$

$=1331+33=1364$

125. (c) $x^2-\sqrt{9.76}x+1=0,\ x>1,$

$\Rightarrow x^2+1=\sqrt{9.76}x\Rightarrow x+\frac{1}{x}=\sqrt{9.76}$

If $x+\frac{1}{x}=k$, Then $x-\frac{1}{x}=\sqrt{k^2-4}$

$\Rightarrow x-\frac{1}{x}=\sqrt{9.76-4}=\sqrt{5.76}=2.4$

$\therefore x^3-\frac{1}{x^3}=\left(x-\frac{1}{x}\right)^3+3\left(x-\frac{1}{x}\right)$

$=(2.4)^3+3\times2.4$

$=13.824+7.2=21.024$

Note:- Using both digital sum and unit digit

DS = (6 × 3) + 3 × 6

= 9 + 9 = '9'

also unit digit = '4'

∴ Option (c) 21.024 has DS = 9 and unit digit '4'

126. (b) $x+\frac{1}{x}=5\sqrt{2}$

If $x+\frac{1}{x}=k$, Then $x^3+\frac{1}{x^3}=k^3-3k$

$\Rightarrow x^3+\frac{1}{x^3}=250\sqrt{2}-15\sqrt{2}=235\sqrt{2}$

$x-\frac{1}{x}=\sqrt{k^2-4}$

$x-\frac{1}{x}=\sqrt{50-4}=\sqrt{46}$

$x^3-\frac{1}{x^3}=k^3+3k$

$x^3-\frac{1}{x^3}=46\sqrt{46}+3\sqrt{46}=49\sqrt{46}$

$\because x^6-\frac{1}{x^6}=\left(x^3-\frac{1}{x^3}\right)\left(x^3+\frac{1}{x^3}\right)$

$=49\times\sqrt{2}\times\sqrt{23}\times235\sqrt{2}=23030\sqrt{23}$

127. (a) Given, that

$x+\frac{1}{x}=2\sqrt{2}$

$x-\frac{1}{x}=\sqrt{8-4}=2$

$x^3-\frac{1}{x^3}=2^3+3\times2=14$

$x^3+\frac{1}{x^3}=(2\sqrt{2})^3-3\times2\sqrt{2}=10\sqrt{2}$

$x^6-\frac{1}{x^6}=(x^3-\frac{1}{x^3})(x^3+\frac{1}{x^3})$

$=14\times10\sqrt{2}=140\sqrt{2}$

128. (c) Given,

$\left(x-\frac{1}{x}\right)=2\sqrt{2}$

$\Rightarrow x^3-\frac{1}{x^3}=\left(2\sqrt{2}\right)^3+3\times2\sqrt{2}=22\sqrt{2}$

$x+\frac{1}{x}=\sqrt{\left(2\sqrt{2}\right)^2+4}=2\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3}=\left(2\sqrt{3}\right)^3-3\times2\sqrt{3}$

$=24\sqrt{3}-6\sqrt{3}=18\sqrt{3}$

$\therefore x^6-\frac{1}{x^6}=\left(x^3-\frac{1}{x^3}\right)\times\left(x^3+\frac{1}{x^3}\right)$

$=22\sqrt{2}\times18\sqrt{3}=396\sqrt{6}$

129. (b) $\left(x-\frac{1}{x}\right)=\sqrt{6}$

$x+\frac{1}{x}=\sqrt{6+4}=\sqrt{10}$

$x^2+\frac{1}{x^2}=(\sqrt{10})^2-2=8$

$x^4+\frac{1}{x^4}=8^2-2=62$

$x^4-\frac{1}{x^4}=\sqrt{3844-4}=\sqrt{3840}$

$\therefore x^8-\frac{1}{x^8}=\left(x^4+\frac{1}{x^4}\right)\left(x^4-\frac{1}{x^4}\right)$

$=62\sqrt{3840}=992\sqrt{15}$

130. (a) $x+\frac{1}{x}=5$

$x^2+\frac{1}{x^2}=23,\ x^4+\frac{1}{x^4}=527$

$x-\frac{1}{x}=\sqrt{5^2-4}=\sqrt{21}$

$\therefore\left(x^8-\frac{1}{x^8}\right)=\left(x^4+\frac{1}{x^4}\right)\left(x^2+\frac{1}{x^2}\right)$

$\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)=527\times23\times5\times\sqrt{21}$

$=60605\sqrt{21}$

131. (c) $x+\frac{1}{x}=3\sqrt{2}$

$\Rightarrow x^2+\frac{1}{x^2}=\left(3\sqrt{2}\right)^2-2=16$

$\Rightarrow x^4+\frac{1}{x^4}=16^2-2=254$

$\Rightarrow x-\frac{1}{x}=\sqrt{\left(3\sqrt{2}\right)^2-4}=\sqrt{14}$

$\therefore\left(x^8-\frac{1}{x^8}\right)$

$=\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}\right)\left(x^4+\frac{1}{x^4}\right)$

$=16\times3\sqrt{2}\times\sqrt{14}\times254=24384\sqrt{7}$

132. (c) $x+\frac{1}{x}=\sqrt{6}$

$\Rightarrow x^2+\frac{1}{x^2}=\left(\sqrt{6}\right)^2-2=4$

$\Rightarrow x^4+\frac{1}{x^4}=4^2-2=14$

$\Rightarrow x-\frac{1}{x}=\sqrt{\left(\sqrt{6}\right)^2-4}=\sqrt{2}$

$\Rightarrow x^8+\frac{1}{x^8}=\left(x^4+\frac{1}{x^4}\right)\times\left(x^4-\frac{1}{x^4}\right)$

$=\left(x^4+\frac{1}{x^4}\right)\times\left(x^2+\frac{1}{x^2}\right)\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$

$=14\times4\times\sqrt{6}\times\sqrt{2}=112\sqrt{3}$

133. (a) $0.4x+\frac{1}{x}=5$

cube both sides,

$(0.4x)^3+\frac{1}{x^3}+3\times0.4x\times\frac{1}{x}\ (0.4x+\frac{1}{x})=125$

$\Rightarrow 0.064x^3+\frac{1}{x^3}=125-3\times5\times0.4$

$=125-6=119$

134. (c) $5a + \frac{4}{a} - 2 = 13 \Rightarrow 5a + \frac{4}{a} = 15$

If $ax + \frac{b}{x} = k$ Then, $a^2x^2 + \frac{b^2}{x^2}$
$= k^2 - 2ab$

$\Rightarrow 25a^2 + \frac{16}{a^2} = 225 - 2 \times 5 \times 4$

$= 225 - 40 = 185$

135. (b) $x^2 - 4x - 3 = 0$

$\Rightarrow x - \frac{3}{x} = 4$

$\therefore x^3 - \frac{27}{x^3} = \left(x - \frac{3}{x}\right)^3 + 3 \times 3\left(x - \frac{3}{x}\right)$

$= (4^3 + 3 \times 3 \times 4) = (64 + 36)$
$= 100$

Then, $\frac{\left(x^4 - \frac{27}{x^2}\right)}{x^2 + 4x - 3}$

Divided by x

$= \frac{x^3 - \frac{27}{x^3}}{x - \frac{3}{x} + 4} = \frac{100}{8} = 12\frac{1}{2}$

136. (d) $x + \frac{1}{9x} = 3$

multiply both sides by 3.

$3x + \frac{1}{3x} = 9$

Squaring both sides,

$9x^2 + \frac{1}{9x^2} = 81 - 2$

$\Rightarrow 9x^2 + \frac{1}{9x^2} = 79$

137. (c) $7b - \frac{1}{4b} = 7$

Multiply by $\frac{4}{7}$ on both sides

$\Rightarrow 4b - \frac{1}{7b} = 4$

$\Rightarrow 16b^2 + \frac{1}{49b^2} = 4^2 + 2 \times 4 \times \frac{1}{7}$

$= 16 + \frac{8}{7} = \frac{120}{7}$

138. (a) $x + \frac{1}{15x} = 3$

Multiply by 3 both sides

$\Rightarrow 3x + \frac{1}{5x} = 9$

$\Rightarrow (3x)^3 + \frac{1}{(5x)^3} = 9^3 - 3 \times 3 \times \frac{1}{5} \times 9$

$\Rightarrow 27x^3 + \frac{1}{125x^3} = \frac{3564}{5}$

$\therefore 9x^3 + \frac{1}{375x^3} = \frac{1}{3} \times \frac{3564}{5} = 237.6$

139. (a) $x + \frac{1}{16x} = 3$

$\Rightarrow 2x + \frac{1}{8x} = 6$

Cubing both sides, we get

$8x^3 + \frac{1}{512x^3} + 3 \times 2x \times \frac{1}{8x} \times 6 = 216$

$\Rightarrow 8x^3 + \frac{1}{512x^3} = 216 - \frac{9}{2} = \frac{423}{2}$

Multiplying by 2 on both sides,

$16x^3 + \frac{1}{256x^3} = 423$

140. (b) If $x + \frac{1}{x} = 2$

then, $x = 1$

$\therefore x^{2723} + \frac{1}{x^{3356}} = 1 + 1 = 2$

141. (a) $x + \frac{1}{x} = 2$

In this Condition $x = 1$

$\therefore x^{1823} + \frac{1}{x^{1929}} = 1 + 1 = 2$

142. (b) $x + \frac{1}{x} = 2$

In this case $x = 1$

$\therefore x^7 + \frac{1}{x^{117}} = (1)^7 + \frac{1}{(1)^{117}} = 1 + 1 = 2$

143. (a) If $x + \frac{1}{x} = 2$, Then $x = 1$

(Fixed property)

$\therefore \left(x^4 + \frac{4}{x^4}\right)\left(x^3 - \frac{4}{x^3}\right)$

$= (1 + 4)(1 - 4) = -15$

144. (c) $\underset{\substack{\downarrow \\ \textcircled{1}}}{a^3} + \underset{\substack{\downarrow \\ \textcircled{1}}}{\frac{1}{a^3}} = 2$

Hence,

$\underset{\substack{\downarrow \\ \textcircled{1}}}{a} + \underset{\substack{\downarrow \\ \textcircled{1}}}{\frac{1}{a}} = 2$

145. (b) $k + \frac{1}{k} + 2 = 0, k < 0$

$k + \frac{1}{k} = -2$

In this case $k = -1$

$\therefore k^{17} + \frac{1}{k^{11}} = (-1)^{17} + \frac{1}{(-1)^{11}}$

$= -1 - 1 = -2$

146. (d) $x = 7 - 4\sqrt{3}$ ....(i)

$\Rightarrow \frac{1}{x} = 7 + 4\sqrt{3}$ ....(ii)

After adding equ. (i) & (ii)

$\Rightarrow x + \frac{1}{x} = 14$

$\therefore x^2 + \frac{1}{x^2} = (14)^2 - 2 = 194$

147. (b) $x = 7 - 4\sqrt{3}$

then, $\frac{1}{x} = 7 + 4\sqrt{3}$

$\therefore x + \frac{1}{x} = 7 - 4\sqrt{3} + 7 + 4\sqrt{3} = 14$

On squaring both side,

$x^2 + \frac{1}{x^2} = 196 - 2 = 194$

148. (a) $x = 8 + \sqrt{5} \Rightarrow x^2 = 69 + 16\sqrt{5}$

$y = 8 - \sqrt{5} \Rightarrow y^2 = 69 - 16\sqrt{5}$

$x^2 + y^2 = 138$

Alternate Method:

$x^2 + y^2 = (8 + \sqrt{5})^2 + (8 - \sqrt{5})^2$

$= 2[8^2 + (\sqrt{5})^2]$

$= 2[64 + 5] = 2 \times 69 = 138$

149. (d) $x = 4 + \sqrt{6} \Rightarrow x^2 = 22 + 8\sqrt{6}$

$y = 4 - \sqrt{6} \Rightarrow y^2 = 22 - 8\sqrt{6}$

$x^2 + y^2 = 44$

Alternate Method:

$x^2 + y^2 = \left(4 + \sqrt{6}\right)^2 + \left(4 - \sqrt{6}\right)^2$

$= 2\left[4^2 + \left(\sqrt{6}\right)^2\right] = 2[16 + 6] = 44$

150. (b) $x = \sqrt{6} + 2, y = \sqrt{6} - 2$

$x^2 = 10 + 4\sqrt{6}, y^2 = 10 - 4\sqrt{6}$

$\Rightarrow \left(\frac{x}{y} + \frac{y}{x}\right)^2 = \left(\frac{x^2 + y^2}{xy}\right)^2$

$= \left(\frac{10 + 4\sqrt{6} + 10 - 4\sqrt{6}}{(\sqrt{6} + 2)(\sqrt{6} - 2)}\right)^2$

$= \left(\frac{20}{2}\right)^2 = 100$

$\therefore \left(\frac{x}{y} + \frac{y}{x}\right)^2 - 3$

$= 100 - 3 = 97$

Alternate Method:-

$x = \sqrt{6} + 2, y = \sqrt{6} - 2$

$\Rightarrow \frac{x}{y} = \frac{\sqrt{6} + 2}{\sqrt{6} - 2} = \frac{(\sqrt{6} + 2)^2}{2}$

Similarly,

$\frac{y}{x} = \frac{(\sqrt{6} - 2)^2}{2}$

$\therefore (\quad) - 3$

$= \left[\frac{(\sqrt{6} + 2)^2}{2} + \frac{(\sqrt{6} - 2)^2}{2}\right]^2 - 3$

$= \left[\frac{2(\sqrt{6})^2 + 2(2)^2}{2}\right]^2 - 3$

$= (10)^2 - 3 = 97$

151. (a) $p = 7 + 4\sqrt{3}$

$\Rightarrow \frac{1}{p} = 7 - 4\sqrt{3} \Rightarrow p + \frac{1}{p} = 14$

$\Rightarrow p^3 + \frac{1}{p^3} = 14^3 - 14 \times 3 = 2702$

$\therefore \frac{p^6 + p^4 + p^2 + 1}{p^3} = p^3 + p + \frac{1}{p} + \frac{1}{p^3}$

$= 2702 + 14 = 2716$

152. (d) $x = \frac{\sqrt{5}-2}{\sqrt{5}+2}$, $\frac{1}{x} = \frac{\sqrt{5}+2}{\sqrt{5}-2}$

$x + \frac{1}{x} = \frac{2(5+4)}{5-4} = 18$

$\therefore \quad x^2 + \frac{1}{x^2} = 18^2 - 2 = 322$

153. (d) $xy = \frac{\sqrt{5}-\sqrt{4}}{\sqrt{5}+\sqrt{4}} \times \frac{\sqrt{5}+\sqrt{4}}{\sqrt{5}-\sqrt{4}} = 1$

When two numbers x and y are reciprocal then $x + y = \frac{2(x^2+y^2)}{x^2-y^2}$

$= \frac{2\left[(\sqrt{5})^2 + (\sqrt{4})^2\right]}{\left[(\sqrt{5})^2 - (\sqrt{4})^2\right]} = \frac{2(5+4)}{(5-4)} = 18$

$x^2 + y^2 = 18^2 - 2 = 322$

$\therefore \frac{x^2 - xy + y^2}{x^2 + xy + y^2} = \frac{322-1}{322+1} = \frac{321}{323}$

154. (c) $pq = 1$

$\frac{p^2}{q} + \frac{q^2}{p} = \frac{p^3+q^3}{pq} = p^3 + q^3$

$p + q = \frac{\sqrt{2}+1}{\sqrt{2}-1} + \frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{2(2+1)}{2-1} = 6$

$p^3 + q^3 = (p+q)\,[(p+q)^2 - 3pq]$

$= 6[6^2 - 3 \times 1] = 6[36 - 3] = 198$

155. (b) $a = (\sqrt{2}-1)^{\frac{1}{3}}$

On cube both side,

$a^3 = \sqrt{2} - 1, \; \frac{1}{a^3} = \sqrt{2} + 1$

Now,

$a^3 - \frac{1}{a^3} = -2$

$\therefore \left(a - \frac{1}{a}\right)^3 + 3\left(a - \frac{1}{a}\right) = a^3 - \frac{1}{a^3}$

$= a^3 - \frac{1}{a^3} - 3\left(a - \frac{1}{a}\right) + 3\left(a - \frac{1}{a}\right)$

$= a^3 - \frac{1}{a^3} = -2$

156. (b) $x = \left(\sqrt{6}-1\right)^{\frac{1}{3}}$

$\Rightarrow x^3 = \sqrt{6} - 1$

$\Rightarrow \frac{1}{x^3} = \frac{1}{\sqrt{6}-1} = \frac{\sqrt{6}+1}{5}$

$\therefore x^3 - \frac{1}{x^3} = \sqrt{6} - 1 - \frac{(\sqrt{6}+1)}{5}$

$= \frac{5\sqrt{6} - 5 - \sqrt{6} - 1}{5} = \frac{4\sqrt{6}-6}{5}$

$\therefore \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right) = x^3 - \frac{1}{x^3} = \frac{4\sqrt{6}-6}{5}$

157. (c) $\left(x + \frac{1}{x}\right)^2 = 3$

$x + \frac{1}{x} = \sqrt{3}$

In this case, $x^6 = -1$

So, $x^6 + \frac{1}{x^6} = -1 - 1 = -2$

158. (b) $N + \frac{1}{N} = \sqrt{3}$

$\Rightarrow N^3 + \frac{1}{N^3} = 0$

$\Rightarrow N^6 + 1 = 0 \Rightarrow N^6 = -1$

$\therefore N^6 + \frac{1}{N^6} + 11 = -1 - 1 + 11 = 9$

159. (b) $x^2 - 15x + 1 = 0 \Rightarrow x + \frac{1}{x} = 15$

$\Rightarrow x^2 + \frac{1}{x^2} = 225 - 2 = 223$

$\Rightarrow x^4 + 1 = 223x^2$

$\Rightarrow x^4 - 223x^2 + 1 = 0$

$\Rightarrow x^4 - 223x^2 = -1$

$\therefore x^4 - 223x^2 + 6 = -1 + 6 = 5$

160. (d) $x + \frac{1}{x} = 8$

$\Rightarrow x^2 + 1 = 8x$

$\Rightarrow x^2 - 8x = -1$

$\therefore \frac{5}{x^2 - 8x + 2} = \frac{5}{-1+2} = 5$

161. (b) $x^2 - 11x + 1 = 0$

$\Rightarrow x + \frac{1}{x} = 11$

$\Rightarrow x^2 + \frac{1}{x^2} = 121 - 2 = 119$

$\Rightarrow x^4 + \frac{1}{x^4} = 119^2 - 2 = 14161 - 2 = 14159$

$\Rightarrow x^8 + 1 = 14159x^4$

$\Rightarrow x^8 - 14159x^4 = -1$

$\Rightarrow x^8 - 14159x^4 + 11 = -1 + 11 = 10$

162. (b) $x^2 - 8x + 1 = 0$

Divided by x

$\Rightarrow x - 8 + \frac{1}{x} = 0 \Rightarrow x + \frac{1}{x} = 8$

$\therefore x^2 + \frac{1}{x^2} = (8^2 - 2) = 62$

$x^4 + \frac{1}{x^4} = (62)^2 - 2 = 3842$

$\Rightarrow x^8 + 1 = 3842x^4$

$\Rightarrow x^8 - 3842x^4 = -1$

$\therefore x^8 - 3842x^4 + 1 = 0$

163. (b) Given, $x(x-5) = -1$

$\Rightarrow x - 5 = \frac{-1}{x}$

$\Rightarrow x + \frac{1}{x} = 5$

$\Rightarrow x^3 + \frac{1}{x^3} = 5^3 - 3 \times 5$

$\Rightarrow x^3 + \frac{1}{x^3} = 110$

$\Rightarrow x^6 + 1 = 110x^3$

$\Rightarrow x^6 - 110x^3 = -1$

$\Rightarrow x^3(x^3 - 110) = -1$

164. (d) $x^4 + \frac{1}{x^4} = 194$

$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 194 + 2$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 196 \Rightarrow x^2 + \frac{1}{x^2} = 14$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 14 + 2$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 16 \Rightarrow x + \frac{1}{x} = 4$

$\Rightarrow x^2 + 1 = 4x \Rightarrow x^2 - 4x = -1$

$\therefore (x-2)^2 = x^2 + 4 - 4x$

$= -1 + 4 = 3$

165. (a) Let, $k^3 = x$

So,

$8x^2 + 15x - 2 = 0$

$\Rightarrow 8x^2 + 16x - x - 2 = 0$

$\Rightarrow 8x(x+2) - 1(x+2) = 0$

$\Rightarrow (8x-1)(x+2) = 0$

$\Rightarrow 8x - 1 = 0 \Rightarrow x = \frac{1}{8}$

$\Rightarrow x + 2 = 0 \Rightarrow x = -2$

[Not possible because of negative value]

Now,

$k^3 = \frac{1}{8} \Rightarrow k = \frac{1}{2} \Rightarrow \frac{1}{k} = 2$

$\therefore (k + \frac{1}{k}) = (\frac{1}{2} + 2) = \frac{5}{2} = 2\frac{1}{2}$

166. (c) $x^2 + 7x + 8 = 0$

Divided by x both sides

$x + 7 + \frac{8}{x} = 0$

$\Rightarrow x + \frac{8}{x} = -7$ ..... (i)

$\therefore \frac{4x}{x^2 - 5x + 8}$

Again divided numerator & denominator by x.

Then,

$\frac{\frac{4x}{x}}{x - 5 + \frac{8}{x}} = \frac{4}{x + \frac{8}{x} - 5}$

$= \frac{4}{-7-5} = -\frac{1}{3}$

Alternate Method:-

$x^2 + 7x + 8 = 0$

$\Rightarrow x^2 + 8 = -7x$

$\therefore \frac{4x}{x^2 - 5x + 8} = \frac{4x}{-7x - 5x} = \frac{4x}{-12x}$

$= -\frac{1}{3}$

167. (d) $x^2 + 6x + 1 = 0$

$\Rightarrow x(x+6) + 1 = 0$

Dividing both side by $(x + 6)$

$x + \frac{1}{x+6} = 0$

Adding 6 both sides

$(x+6) + \frac{1}{(x+6)} = 6$

$\therefore (x+6)^3 + \frac{1}{(x+6)^3} = 6^3 - 3 \times 6$

$= 216 - 18 = 198$

168. (d) $A + \frac{1}{A} = -1$

$\Rightarrow A^2 + 1 + A = 0$

$\because A^3 - 1 = (A - 1)(A^2 + 1 + A)$

$\Rightarrow A^3 = +1$

$\therefore \frac{A^6 + A^3 - 1}{A^9 + A^3 - 1} = \frac{A^3 - \frac{1}{A^3} + 1}{(A^3)^3 + A^3 - 1} = \frac{1 - 1 + 1}{1 + 1 - 1} = 1$

169. (d) $x^2 - \frac{1}{x^2} = 4\sqrt{6}$

$\Rightarrow \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right) = 2\sqrt{3} \times 2\sqrt{2}$

So, $x - \frac{1}{x} = 2\sqrt{2}$

$\Rightarrow x^3 - \frac{1}{x^3} = (2\sqrt{2})^3 + 3 \times 2\sqrt{2}$

$= 16\sqrt{2} + 6\sqrt{2} = 22\sqrt{2}$

170. (a) $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{5},\ x \neq 0$

$x + \frac{1}{x} = 5 + 2 = 7$

$\Rightarrow x^3 + \frac{1}{x^3} = 7^3 - 3 \times 7 = 322$

$\therefore \frac{x^4 + \frac{1}{x^2}}{x^2 + 1} = \frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x}} = \frac{322}{7} = 46$

171. (d) $2x^2 - 1 = 3x$

Taking cube both side,

$8x^6 - 1 - 3 \times 2x^2(2x^2 - 1) = 27x^3$

$\Rightarrow 8x^6 - 1 - 6x^2(3x) = 27x^3$

$\Rightarrow 8x^6 - 1 - 18x^3 = 27x^3$

$\Rightarrow 8x^6 - 45x^3 - 1 = 0$

On adding $20x^3$ both sides

$\Rightarrow 8x^6 - 25x^3 - 1 = 20x^3$

172. (d) $2x - \frac{1}{x} = 7$

$\Rightarrow 2x^2 - 1 = 7x$

Taking cube both side,

$8x^6 - 1 - 3 \times 2x^2(2x^2 - 1) = 343x^3$

$\Rightarrow 8x^6 - 1 - 42x^3 = 343x^3$

$\Rightarrow 8x^6 - 1 = 385x^3$

$\therefore \frac{8x^6 + 5x^3 - 1}{8x^6 - 25x^3 - 1} = \frac{385x^3 + 5x^3}{385x^3 - 25x^3}$

$= \frac{390x^3}{360x^3} = \frac{13}{12}$

173. (c) $2x - y = 2 \Rightarrow x - \frac{y}{2} = 1$

Cube both side,

$x^3 - \frac{y^3}{8} - 3 \times x \times \frac{y}{2} \times \left(x - \frac{y}{2}\right) = 1$

$\Rightarrow x^3 - \frac{y^3}{8} - 3 \times \frac{3}{2} \times \frac{1}{2} = 1$

$\Rightarrow x^3 - \frac{y^3}{8} = 1 + \frac{9}{4}$

$\Rightarrow x^3 - \frac{y^3}{8} = \frac{13}{4}$

SMART APPROACH:-

Put $y = 1$ and $x = \frac{3}{2}$

$x^3 - \frac{y^3}{8} = \frac{27}{8} - \frac{1}{8} = \frac{26}{8} = \frac{13}{4}$

174. (a) $4x^4 - 37x^2 + 9 = 0$

$\Rightarrow 4x^2 - 37 + \frac{9}{x^2} = 0$

$\Rightarrow 4x^2 + \frac{9}{x^2} = 37$

Now, Subtract 12 from both sides

$\Rightarrow 4x^2 + \frac{9}{x^2} - 12 = 37 - 12 = 25$

$\left(2x - \frac{3}{x}\right)^2 = (5)^2 \Rightarrow 2x - \frac{3}{x} = 5$

$\therefore 8x^3 - \frac{27}{x^3} = 5^3 + 3 \times 5 \times 2 \times 3$

$= 125 + 90 = 215$

175. (b) In the given option $(a + b)^2 = a^2 + b^2 + 2ab$ is an identity.

176. (d) $2x^2 - 32 = 2(x^2 - 16)$

$= 2(x + 4)(x - 4)$

177. (b) $(x + y)^2 + (x - y)^2$

$= x^2 + y^2 + 2xy + x^2 + y^2 - 2xy$

$= 2(x^2 + y^2)$

Alternate Method:-

Put,

$x = 2,\ y = 1$

$(x + y)^2 + (x - y)^2$

$= (3)^2 + (1)^2 = 10$

Go through options,

$2(x^2 + y^2) = 2(2^2 + 1^2) = 10$

178. (b) $[(a + b)^2 = a^2 + b^2 + 2ab]$

$49a^2 + 70ab + 25b^2$

$= (7a)^2 + 2 \times 7 \times 5 \times ab + (5b)^2$

$= (7a + 5b)^2$

179. (b) $\frac{x^2 - 9}{x + 3} = \frac{(x + 3)(x - 3)}{x + 3} = x - 3$

180. (b) $\frac{l^2 - m^2}{(l + m)^2} = \frac{(l - m)(l + m)}{(l + m)^2} = \frac{(l - m)}{(l + m)}$

181. (b) $\frac{x^2 - 1}{x - 1} - \frac{x^2 - 9}{x - 3} = \frac{(x + 1)(x - 1)}{(x - 1)} - \frac{(x + 3)(x - 3)}{x - 3}$

$= (x + 1) - (x + 3) = x + 1 - x - 3 = -2$

Alternate Method:

Put $x = 0$

$\frac{x^2 - 1}{x - 1} - \frac{x^2 - 9}{x - 3} = 1 - \frac{9}{3} = 1 - 3 = -2$

182. (b) $\frac{4x^2 + 9y^2 - 12xy}{3y - 2x} = \frac{(3y - 2x)^2}{3y - 2x}$

$= 3y - 2x$

183. (d) $\frac{4x^2 - 49y^2}{2x + 7y} + 7y - 2x$

$= \frac{(2x + 7y)(2x - 7y)}{(2x + 7y)} + 7y - 2x$

$= 2x - 7y + 7y - 2x = 0$

184. (c) $\frac{x^4 - 2x^2 + 1}{x^2 - 2x + 1}$

$\Rightarrow \frac{(x^2 - 1)^2}{(x - 1)^2} = \frac{[(x + 1)(x - 1)]^2}{(x - 1)^2}$

$= (x + 1)^2 = x^2 + 2x + 1$

Alternate Method:

$\frac{x^4 - 2x^2 + 1}{x^2 - 2x + 1}$ Put $x = 2$

$\Rightarrow \frac{16 - 2 \times 4 + 1}{4 - 4 + 1} = 9$

Go through options,

$x^2 + 2x + 1 = 4 + 4 + 1 = 9$

185. (c) $\frac{9x^2 + 12xy + 4y^2}{36}$

$= \frac{(3x + 2y)^2}{36} = \left(\frac{3x + 2y}{6}\right)^2$

$= \left(\frac{3x}{6} + \frac{2y}{6}\right)^2 = \left(\frac{x}{2} + \frac{y}{3}\right)^2$

Alternate Method:

Put $x = 1,\ y = 2$

$\Rightarrow \frac{9x^2 + 12xy + 4y^2}{36} = \frac{9 + 24 + 16}{36} = \frac{49}{36}$

Option (c) $\left(\frac{1}{2} + \frac{2}{3}\right)^2 = \left(\frac{3 + 4}{6}\right)^2 = \frac{49}{36}$

Hence, satisfied.

186. (a) $a + b + c = 0$

$\Rightarrow a + b = -c$

Squaring both sides

$\Rightarrow a^2 + b^2 + 2ab = c^2$

187. (c) $(3x + 17 - 2y)(3x - 17 - 2y)$

$= \{(3x - 2y) + 17\}\{(3x - 2y) - 17\}$

$= (3x - 2y)^2 - (17)^2$

$= 9x^2 - 12xy + 4y^2 - 289$

188. (c) $\frac{(1 + x^2)}{(1 - x)} \div \frac{(1 - x^4)}{(x - 1)} \times \frac{x(1 - x)}{(1 + x)}$

$= \frac{1 + x^2}{1 - x} \times \frac{x - 1}{(1 + x^2)(1 - x^2)} \times \frac{x(1 - x)}{1 + x}$

$= \frac{-1}{(1 - x)(1 + x)} \times \frac{x(1 - x)}{1 + x} = \frac{-x}{(1 + x)^2}$

189. (b) $\frac{1 + x}{1 - x^2} \div \frac{1 + x}{1 - x^4} - \frac{1 - x^4}{1 - x} \times \frac{1 + x}{1 - x^2}$

$= (1 + x^2) - \frac{(1 + x^2)(1 + x)}{(1 - x)}$

$= (1 + x^2) + \frac{(1 + x^2)(1 + x)}{(x - 1)}$

$= (1 + x^2)\frac{(x - 1 + 1 + x)}{x - 1} = \frac{(1 + x^2)(2x)}{x - 1}$

Alternate Method:

Put $x = 2$

$\frac{1 + x}{1 - x^2} \div \frac{1 + x}{1 - x^4} - \frac{1 - x^4}{1 - x} \times \frac{1 + x}{1 - x^2}$

$= \frac{3}{-3} \div \frac{3}{1 - 16} - \frac{1 - 16}{-1} \times \frac{3}{-3}$

$= -1 \times (-5) + 15 = 20$

Go through option (a)

$\frac{(1 + x^2)}{(x - 1)} \times 2x = \left(\frac{1 + 4}{1}\right) \times 2 \times 2 = 20$

190. (b) We know that,
$(x + y)^2 - (x - y)^2 = 4xy$
Let, $x = a^2,\ y = b^2 - c^2$

$$\frac{(a^2 + b^2 - c^2)^2 - (a^2 - b^2 + c^2)^2}{b^2 - c^2}$$

$$= \frac{(x + y)^2 - (x - y)^2}{y^2} = \frac{4xy}{y} = 4x$$

Given, $x = a^2,\ 4x = 4a^2$

Alternate Method:

Put, $c = 0$

$$\frac{(a^2 + b^2)^2 - (a^2 - b^2)^2}{b^2} = \frac{4a^2b^2}{b^2} = 4a^2$$

191. (b) $(x - 5)^2 + (x + 3)^2 + 4x$
$= x^2 + 25 - 10x + x^2 + 9 + 6x + 4x$
$= 2x^2 + 34$
$= 2(x^2 + 17)$

Alternate Method:

$(x - 5)^2 + (x + 3)^2 + 4x$
Put $x = 1$
$\Rightarrow (-4)^2 + (4)^2 + 4 = 16 + 16 + 4 = 36$
Go through options, $2(x^2 + 17)$
$= 2(1 + 17) = 2 \times 18 = 36$

192. (c) $(a - b)(b + a)(a^2 + b^2)(2b^4 + 2a^4)$
$= (a - b)(a + b)(a^2 + b^2)2(a^4 + b^4)$
$= (a^2 - b^2)(a^2 + b^2)2(a^4 + b^4)$
$= 2(a^4 - b^4)(a^4 + b^4) \quad = 2(a^8 - b^8)$

Alternate Method:

Put $b = 0$
$\Rightarrow (a)\ (a)\ (a^2)\ (2a^4) = 2a^8$
Go through options, $2(a^8 - b^8) = 2a^8$

193. (a) $(x + 1)^2 + (x + 2)^2 = 16$
$\Rightarrow x^2 + 1 + 2x + x^2 + 4 + 4x = 16$
$\Rightarrow 2x^2 + 6x + 5 = 16$
$\Rightarrow 2x^2 + 6x = 11$
$\Rightarrow 4x^2 + 12x = 22$
$\therefore 4x^2 + 12x + 40 = 22 + 40 = 62$

194. (a) $(a + b)(a - b) = a^2 - b^2$

$$16y^2 - k = \left(4y + \frac{3}{2}\right)\left(4y - \frac{3}{2}\right)$$

$$\Rightarrow 16y^2 - k = (4y)^2 - \left(\frac{3}{2}\right)^2$$

On comparing, $k = \frac{9}{4}$

195. (a) $[(1 + p)\ (1 + p^2)\ (1 + p^4)\ (1 + p^8)\ (1 + p^{16})\ (1 + p) - 1]$
$= (1+p)\ (1-p)\ (1+p^2)\ (1+p^4)\ (1+p^8)\ (1+p^{16}) - 1$
$= (1 - p^2)\ (1 + p^2)\ (1 + p^4)\ (1 + p^8)(1 + p^{16}) - 1$
$= (1 - p^4)\ (1 + p^4)\ (1 + p^8)\ (1 + p^{16}) - 1$
$= (1 - p^8)\ (1 + p^8)\ (1 + p^{16}) - 1$
$= (1 - p^{16})\ (1 + p^{16}) - 1$
$= 1 - p^{32} - 1 = -p^{32}$

Alternate Method:

$$[\underbrace{(1 + p)(1 + p^2)(1 + p^4)(1 + p^8)(1 + p^{16})(1 - p)}_{(1^{32} - p^{32})}]$$

So,
$[(1+p)(1+p^2)(1+p^4)(1+p^8)(1+p^{16})(1-p) - 1]$
$= 1 - p^{32} - 1 = -p^{32}$

196. (c) $(1 + x)(1 + x^2)(1 + x^4)(1 + x^8)(1 - x)$
$= (1 - x^2)\ (1 + x^2)\ (1 + x^4)\ (1 + x^8)$
$= (1 - x^4)\ (1 + x^4)\ (1 + x^8)$
$= (1 - x^8)\ (1 + x^8) = (1 - x^{16})$

197. (d) $$\left(k - \frac{1}{k}\right)\left(k^2 + \frac{1}{k^2}\right)\left(k^4 + \frac{1}{k^4}\right)\left(k^8 + \frac{1}{k^8}\right)\left(k^{16} + \frac{1}{k^{16}}\right)$$

(To multiply and divide by $\left(k + \frac{1}{k}\right)$ to make a pair)

$$= \frac{\left(k + \frac{1}{k}\right)}{k + \frac{1}{k}}\left(k - \frac{1}{k}\right)\left(k^2 + \frac{1}{k^2}\right)\left(k^4 + \frac{1}{k^4}\right)\left(k^8 + \frac{1}{k^8}\right)\left(k^{16} + \frac{1}{k^{16}}\right)$$

$$= \frac{\left(k^2 - \frac{1}{k^2}\right)}{k + \frac{1}{k}}\left(k^2 + \frac{1}{k^2}\right)\left(k^4 + \frac{1}{k^4}\right)\left(k^8 + \frac{1}{k^8}\right)\left(k^{16} + \frac{1}{k^{16}}\right) = \frac{k^{32} - \frac{1}{k^{32}}}{k + \frac{1}{k}}$$

198. (b) $$A = \frac{58^2 - 25^2}{46^2 - 37^2} = \frac{83 \times 33}{83 \times 9} = \frac{11}{3}$$

$$B = \frac{26^2 - 15^2}{56^2 - 15^2} = \frac{41 \times 11}{71 \times 41} = \frac{11}{71}$$

$$\therefore \frac{1}{B} - \frac{20}{A} = \frac{71}{11} - \frac{20 \times 3}{11} = 1$$

199. (d) $(a + b) = 10$
squaring both sides
$a^2 + b^2 + 2ab = 100$

$\Rightarrow 2ab = 100 - 58 \quad \Rightarrow ab = \frac{42}{2} = 21$

Alternate Method:

Put $a = 7,\ b = 3$
$a^2 + b^2 = 7^2 + 3^2 = 58$ (verified)
$\therefore ab = 7 \times 3 = 21$

200. (c) We know that,
$(a + b)^2 - (a - b)^2 = 4ab$
$(2a + 3b)^2 - (2a - 3b)^2 = 4 \times 2a \times 3b$
$\Rightarrow (14)^2 - (10)^2 = 24\ ab$
$\Rightarrow 96 = 24\ ab \Rightarrow ab = 4$

Alternate Method:

Given, $2a + 3b = 14$
and $2a - 3b = 10$

$$\Rightarrow a = \frac{24}{4} = 6$$

$$\text{and, } b = \frac{14 - 12}{3} = \frac{2}{3}$$

$$\therefore ab = 6 \times \frac{2}{3} = 4$$

201. (c) $x + y = 10,\ xy = 12$
$\because x^2 - xy + y^2 = x^2 + 2xy + y^2 - 3xy$
$= (x + y)^2 - 3xy$
$= 100 - 3 \times 12 = 100 - 36 = 64$

202. (c) $(a + 2b)^2 = (a - 2b)^2 + 4 \times a \times 2b$
$\Rightarrow (a + 2b)^2 = 8^2 + 4 \times 9$
$\Rightarrow (a + 2b)^2 = 100 \qquad \therefore a + 2b = 10$

203. (b) $(5x - 3y)^2 = (5x + 3y)^2 - 4 \times 5x \times 3y$
$\Rightarrow (5x - 3y)^2 = (5x + 3y)^2 - 60xy$
$\Rightarrow (5x - 3y)^2 = 225 - 180$
$\Rightarrow (5x - 3y)^2 = 45$
$\Rightarrow 5x - 3y = 3\sqrt{5}$

204. (c) $(2p + 5q)^2 = 4p^2 + 25q^2 + 2 \times 2p \times 5q$
$\Rightarrow (12)^2 = 4p^2 + 25q^2 + 20pq$
$\Rightarrow 144 = 4p^2 + 25q^2 + 20 \times 3$
$\Rightarrow 4p^2 + 25q^2 = 84$

205. (a) $(2x + y)^2 = 4x^2 + y^2 + 4xy$
$\Rightarrow (2x + y)^2 = 40 + 24$
$\Rightarrow (2x + y)^2 = 64$
$\therefore 2x + y = \sqrt{64} = 8$

Alternate Method:

$4x^2 + y^2 = 40,\ xy = 6$
Here $x = 3,\ y = 2$ (satisfied)
$\therefore 2x + y = 6 + 2 = 8$

206. (a) $a + b = 11,\ ab = 35$
$a^2 + b^2 = 121 - 70 = 51$
$\because a^4 + b^4 = (a^2 + b^2)^2 - 2a^2b^2$
$= 51^2 - 2 \times 35^2 = 2601 - 2450$
$= 151$

207. (a) $(x - y) = 1,\ x^2 + y^2 = 41$
$(x - y)^2 = x^2 + y^2 - 2xy$
$\Rightarrow 1^2 = 41 - 2xy$
$\Rightarrow 2xy = 40$
$\Rightarrow xy = 20$
$x^2 + y^2 + 2xy = (x + y)^2$
$\Rightarrow 41 + 20 \times 2 = (x + y)^2$
$\Rightarrow 81 = (x + y)^2$
$\Rightarrow x + y = 9$

SMART APPROACH:-

$x - y = 1$ and $x^2 + y^2 = 41$
$x = 5$ and $y = 4$ satisfied the given equation.
$\therefore x + y = 5 + 4 = 9$

208. (c) $x^2 - 2xy = 84$ .....(i)
$x - y = -10$ ....(ii)
Square both sides (ii)
$x^2 + y^2 - 2xy = 100$
$\Rightarrow x^2 - 2xy = 100 - y^2$
$\Rightarrow 84 = 100 - y^2$
$\Rightarrow y^2 = 16$
$\Rightarrow y = 4$

209. (b) $a + b = 12,\ ab = 35$
$a^2 + b^2 = 12^2 - 70 = 74$
$a^4 + b^4 = (74)^2 - 2 \times 35^2$
$= 5476 - 2450 = 3026$
$\therefore a^4 + b^4 - 10^3 = 3026 - 1000 = 2026$

SMART APPROACH:-

$a + b = 12,\ ab = 35$
$a = 7,\ b = 5$ satisfied
The condition.
$a^4 + b^4 - 10^3 = 7^4 + 5^4 - 1000$
$= 2401 + 625 - 1000$
$= 2026$

210. (b) $\frac{x}{y}+\frac{y}{x}=\frac{x^2+y^2}{xy}=\frac{(x+y)^2-2xy}{xy}$

$=\frac{(12)^2-2\times6}{6}=22$

211. (d) $\frac{x}{y}+\frac{y}{x}=\frac{x^2+y^2}{xy}$

$=\frac{(x+y)^2-2xy}{xy}$

$=\frac{(18)^2-2\times9}{9}=34$

212. (a) $a^2+b^2=148,\ ab=54$

$(a+b)^2=a^2+b^2+2ab$

$\Rightarrow (a+b)^2=148+108=256$

$\Rightarrow a+b=16$

$(a-b)^2=a^2+b^2-2ab$

$\Rightarrow (a-b)^2=148-108=40$

$\Rightarrow a-b=2\sqrt{10}$

$\therefore \frac{a+b}{a-b}=\frac{16}{2\sqrt{10}}=\frac{8}{\sqrt{10}}$

213. (c) $\left(\frac{x+y}{x-y}\right)^2=\frac{x^2+y^2+2xy}{x^2+y^2-2xy}$

$=\frac{427+2\times202}{427-2\times202}=\frac{427+404}{427-404}$

$\Rightarrow \frac{x+y}{x-y}=\sqrt{\frac{831}{23}}$

214. (a) I. $100^2-99^2+98^2-97^2+96^2-95^2+94^2-93^2+\dots\dots\dots+2^2-1^2$

$=(100-99)(100+99)+(98-97)(98+97)+(96-95)(96+95)+\dots\dots+(2-1)(2+1)$

$=100+99+98+97+96+95+\dots\dots+(2+1)$

$=\frac{n\times(n+1)}{2}=\frac{100\times101}{2}=5050$

It is correct.

II. $8\left(x+\frac{1}{x}\right)=-16$

$\Rightarrow x+\frac{1}{x}=-2\Rightarrow x=-1$

$x^{197}+\frac{1}{x^{197}}=-1-1=-2$

It is incorrect

Hence, only (i) is correct.

215. (c) I. $100^2-99^2+98^2-97^2+96^2-95^2+94^2-93^2+\dots\dots\dots\dots+22^2-21^2$

$=(100-99)(100+99)+(98-97)(98+97)+\dots\dots\dots+(22-21)(22+21)=100+99+98+97+\dots\dots\dots+22+21$

$=\frac{100\times101}{2}-\frac{20\times21}{2}$

$=5050-210=4840.$

$\therefore$ It is true

II. $\left(k^2+\frac{1}{k^2}\right)\left(k-\frac{1}{k}\right)\left(k^4+\frac{1}{k^4}\right)\left(k+\frac{1}{k}\right)\left(k^4-\frac{1}{k^4}\right)$

$=\left(k^2+\frac{1}{k^2}\right)\left(k^2-\frac{1}{k^2}\right)\left(k^4+\frac{1}{k^4}\right)\left(k^4-\frac{1}{k^4}\right)$

$=\left(k^4-\frac{1}{k^4}\right)\left(k^8-\frac{1}{k^8}\right)\neq\left(k^{16}-\frac{1}{k^{16}}\right)$

$\therefore$ It is not true

So, only option (c) is correct.

216. (b) $x+y=1$ and $xy(xy-2)=12$

$\Rightarrow x^2+y^2+2xy=1$

$\Rightarrow x^2+y^2=1-2xy$

Squaring both sides, we get

$x^4+y^4+2x^2y^2=1+4x^2y^2-4xy$

$\Rightarrow x^4+y^4=1+2x^2y^2-4xy$

$\Rightarrow x^4+y^4=1+2xy\ (xy-2)$

$\Rightarrow x^4+y^4=1+2\ (12)$

$\Rightarrow x^4+y^4=1+24=25$

217. (a) ATQ, $\frac{x}{y}+\frac{y}{x}=1$

$\Rightarrow x^2+y^2=xy$

$\Rightarrow x^2+y^2-xy=0$

$\because x^3+y^3=(x+y)(x^2+y^2-xy)$

$=2\times0=0$

SMART APPROACH:-

If $x+\frac{1}{x}=1$

Then, $x^3=-1$

So, $\frac{x}{y}+\frac{y}{x}=1$ then $\frac{x^3}{y^3}=-1,\ x^3=-y^3$

$x^3+y^3=0$

218. (b) $[a^3+b^3=(a+b)(a^2+b^2-ab)]$

$\frac{a}{b}+\frac{b}{a}=1$

$\Rightarrow \frac{a^2+b^2}{ab}=1$

$\Rightarrow a^2+b^2=ab$

$\Rightarrow a^2+b^2-ab=0$

$\therefore \frac{a^3+b^3}{3ab}=\frac{(a+b)(a^2+b^2-ab)}{3ab}=0$

219. (b) $1.55^2+0.55^2+1.55\times0.55$

Multiply and divide by $(1.55-0.55)$

$\frac{(1.55-0.55)(1.55^2+0.55^2+1.55\times0.55)}{(1.55-0.55)}$

We know, $a^3-b^3=(a-b)(a^2+b^2+ab)$

$\Rightarrow \frac{1.55^3-0.55^3}{1}=1.55^3-0.55^3$

220. (a) $(x+2y)^3=x^3+8y^3+6x^2y+12y^2x$

$(x-2y)^3=x^3-8y^3-6x^2y+12y^2x$

$\therefore (x+2y)^3+(x-2y)^3=2x^3+24y^2x$

Alternate Method:

$[(a+b)^3+(a-b)^3=2a(a^2+3b^2)]$

$\therefore (x+2y)^3+(x-2y)^3$

$=2x(x^2+3\times(2y)^2)$

$=2x(x^2+12y^2)$

$=2x^3+24xy^2$

221. (b) $3\left[a-\frac{1}{a}\right]+\left[a-\frac{1}{a}\right]^3$

$=3\left[a-\frac{1}{a}\right]+\left\{a^3-\frac{1}{a^3}-3\left[a-\frac{1}{a}\right]\right\}$

$=a^3-\frac{1}{a^3}$

222. (a) $(x+y)^3-(x-y)^3-6y(x^2-y^2)$

$=x^3+y^3+3xy(x+y)-\{x^3-y^3-3xy(x-y)\}-6yx^2+6y^3$

$=x^3+y^3+3x^2y+3xy^2-\{x^3-y^3-3x^2y+3xy^2\}-6yx^2+6y^3$

$=x^3+y^3+3x^2y+3xy^2-x^3+y^3+3x^2y-3xy^2-6yx^2+6y^3=8y^3$

Alternate Method:

$(x+y)^3-(x-y)^3=2y^3+6x^2y$

$\therefore (x+y)^3-(x-y)^3-6y(x^2-y^2)$

$=2y^3+6x^2y-6x^2y+6y^3=8y^3$

SMART APPROACH:-

Put $x=0,\ y=1$

$(x+y)^3-(x-y)^3-6y\ (x^2-y^2)$

$=1+1+6=8$

Putting the value of x and y in option (a) then satisfy the eq."

223. (d) Consider, $(x+y)^3-(x-y)^3-3y(2x^2-3y^2)=ky^3$

$\Rightarrow x^3+y^3+3x^2y+3xy^2-x^3+y^3+3x^2y-3xy^2-6x^2y+9y^3=ky^3$

$\Rightarrow y^3+y^3+9y^3=ky^3$

$\therefore 11y^3=ky^3\Rightarrow k=11$

224. (d) $(x+a)^3+(x-a)^3=2x(x^2+a^3)$

So, $(x+3)^3+(x-3)^3=2x(x^2+27)$

Then, $\frac{2x\ (x^2+27)}{x^2+27}=2x$

Alternate Method:

$\frac{(x+3)^3+(x-3)^3}{x^2+27}$

Put $x=1$

$\Rightarrow \frac{(4)^3+(-2)^3}{1+27}=\frac{64-8}{28}=\frac{56}{28}=2$

Put value of x in options,

$2x=2\times1=2$

225. (b) $\frac{17^3-7^3}{17^2+7^2+k}=10$

$[\because a^3-b^3=(a-b)(a^2+b^2+ab)]$

$\Rightarrow \frac{(17-7)(17^2+7^2+119)}{17^2+7^2+k}=10$

$\Rightarrow 17^2+7^2+119=17^2+7^2+k$

$\therefore k=119$

226. (a) $\frac{3(16^3-6^3)}{(16^2+6^2+Q)}=30$

$\Rightarrow \frac{(16^3-6^3)}{(16^2+6^2+Q)}=(16-6)$

$\Rightarrow (16^2+6^2+Q)=(16^2+6^2+96)$

Here, $Q=96$

227. (a) $x^3-y^3=(x-y)[(x-y)^2+3xy]$

$\Rightarrow x^3-y^3=25[25^2+3\times444]$

$\Rightarrow x^3-y^3=25[625+1332]$

$\Rightarrow x^3-y^3=48925$

228. (b) Given,

$(a-b)=5,\ ab=25$

$a^3-b^3=(a-b)[(a-b)^2+3ab]$

$=5[5^2+3\times25]$

$=5(25+75)=500$

229. (b) $a+b=10,\ ab=6$

$a^3+b^3=(a+b)\{(a+b)^2-3ab\}$

$=10\{(10)^2-3\times6\}=10\times82$

$=820$

230. (c) A.T.Q.

$2x+3y=9$ and $xy=3$

$\because (2x)^3+(3y)^3=(2x+3y)[(2x+3y)^2-3\times2x\times3y]$

$\Rightarrow 8x^3+27y^3=9[81-54]$

$=9\times27=243$

SMART APPROACH:-

$x = 3$ and $y = 1$

$8x^3 + 27y^3 = 8 \times 27 + 27$

$= 27 \times 9 = 243$

231. (b) $x + 6y = 8,\ xy = 2$

$(x^3 + 216y^3) = ?$

$x = 2$ and $y = 1$ satisfy the both equ.

$\therefore x^3 + 216y^3 = 2^3 + 216 \times 1 = 8 + 216 = 224$

232. (d) $a^3 + b^3 = 217,\ a + b = 7$

$a^3 + b^3 = (a + b)\,[(a + b)^2 - 3ab]$

$\Rightarrow 217 = 7[49 - 3ab]$

$\Rightarrow 31 = 49 - 3ab$

$\Rightarrow 3ab = 18 \Rightarrow ab = 6$

SMART APPROACH:-

$a = 6$ and $b = 1$ satisfy both equation then $ab = 6 \times 1 = 6$

233. (d) Given,

$(a - b) = 9$

$a^3 - b^3 = 4401$

$\Rightarrow a^3 - b^3 = (a - b)\,[(a - b)^2 + 3ab]$

$\Rightarrow 4401 = 9[81 + 3ab]$

$\Rightarrow 489 - 81 = 3ab$

$ab = \dfrac{408}{3} = 136$

Alternate Method:

Put $a = 17,\ b = 8$

$a^3 - b^3 = 17^3 - 8^3 = 4401$ (verified)

$\therefore ab = 17 \times 8 = 136$

234. (d) $3a + 2b = 27,\ (27a^3 + 8b^3) = 1458,\ 2ab = ?$

Cube both sides,

$27a^3 + 8b^3 + 3 \times 3a \times 2b \times (3a + 2b) = 27^3$

$\Rightarrow 27a^3 + 8b^3 + 18ab \times 27 = 27^3$

$\Rightarrow 1458 + 18ab \times 27 = 27^3$

$\Rightarrow 54 + 18ab = 27^2$

$\Rightarrow 6 + 2ab = 27 \times 3$

$\Rightarrow 2ab = 27 \times 3 - 6 \Rightarrow 2ab = 75$

235. (c) $x + y = 1$

cube on both sides

$x^3 + y^3 + 3xy\,(x + y) = 1^3$

$\Rightarrow x^3 + y^3 + 3xy = 1$

Alternate Method:-

Put $x = 1,\ y = 0$

$\therefore x^3 + y^3 + 3xy = 1$

236. (a) $x + y + 3 = 0$

$\Rightarrow x + y = -3$

Cubing both sides,

$x^3 + y^3 + 3xy\,(x + y) = -27$

$\Rightarrow x^3 + y^3 + 3xy\,(-3) = -27$

$\Rightarrow x^3 + y^3 - 9xy = -27$

$\therefore x^3 + y^3 - 9xy + 9 = -27 + 9 = -18$

Alternate Method:

Put, $y = 0$

$x + y + 3 = 0$

$\Rightarrow x + 0 + 3 = 0 \Rightarrow x = -3$

$\therefore x^3 + y^3 - 9xy + 9$

$= x^3 + 0 - 0 + 9 = (-3)^3 + 9 = -18$

237. (b) $x = 3y + 4$

$\Rightarrow x - 3y = 4$

$\Rightarrow (x - 3y)^3 = (4)^3$

$\Rightarrow x^3 - 27y^3 - 9xy\,(x - 3y) = 64$

$\Rightarrow x^3 - 27y^3 - 36xy = 64$

Alternate Method:-

$x - 3y = 4$

Put, $y = 0 \Rightarrow x = 4$

Then, $x^3 - 27y^3 - 36xy = 4^3 = 64$

238. (a) $8a^3 - b^3 = (2a)^3 - (b)^3$

$\Rightarrow 999 = (2a - b)[(2a - b)^2 + 6ab]$

$\Rightarrow 999 = 3[9 + 6ab]$

$\Rightarrow 333 - 9 = 6ab$

$\Rightarrow ab = \dfrac{324}{6} = 54$

$\because (2a + b)^2 = (2a - b)^2 + 4\,(2a)(b)$

$= 9 + 432 = 441$

$\Rightarrow 2a + b = 21$

$\therefore 4a^2 - b^2 = (2a + b)\,(2a - b)$

$= 21 \times 3 = 63$

Alternate Method:-

Put $a = 6,\ b = 9$

$\Rightarrow 2a - b = 3$

$\Rightarrow 2 \times 6 - 9 = 3$ (satisfied)

$8a^3 - b^3 = 999$

$\Rightarrow 8(6)^3 - (9)^3 = 1728 - 729$

$= 999$ (satisfied)

$\therefore 4a^2 - b^2 = 144 - 81 = 63$

239. (c) $a^3 + 3a^2 + 3a = 63$

$\Rightarrow a^3 + 3a^2 + 3a + 1 = 63 + 1$

$\Rightarrow (a + 1)^3 = 64 \Rightarrow (a + 1)^3 = (4)^3$

$\Rightarrow a + 1 = 4 \Rightarrow a = 3$

$\therefore a^2 + 2a = 9 + 2 \times 3 = 15$

240. (d) $xy = -6,\ x^3 + y^3 = 19$

$x = 3$ and $y = -2$ satisfy both equ.

$\therefore \dfrac{1}{x^{-1}} + \dfrac{1}{y^{-1}} = x + y = 3 - 2 = 1$

Alternate Method:

$xy = -6,\ x^3 + y^3 = 19$

$x^3 + y^3 = (x + y)\,[(x + y)^2 - 3xy]$

Let $(x + y) = A$

$\Rightarrow 19 = A(A^2 + 18)$

Here, $A = 1$ satisfies

$\Rightarrow x + y = 1$

241. (c) Given $2x + 3y = 4$

So, $4x^2 + 9y^2 = 16 - 2 \times 2x \times 3y$

$\Rightarrow 64 = 16 - 12 \times y \times x$

$\Rightarrow xy = -4$

$\therefore 8x^3 + 27y^3 = (2x + 3y)\,[(2x + 3y)^2 - 3 \times 2x \times 3y]$

$= 4[16 - 18 \times (-4)]$

$= 4[16 + 72] = 352$

242. (a) $x^3 - y^3 = 184,\ x - y = 4$

$x^3 - y^3 = (x - y)[(x - y)^2 + 3xy]$

$\Rightarrow 184 = 4[(x - y)^2 + 3xy]$

$\Rightarrow 46 = 4^2 + 3xy$

$\Rightarrow xy = 10$

$(x + y)^2 - (x - y)^2 = 4xy$

$\Rightarrow (x + y)^2 - (4)^2 = 4xy$

$\Rightarrow (x + y)^2 = 56$

$\Rightarrow x + y = \sqrt{56} = 2\sqrt{14}$

243. (c) ATQ,

$x^3 - y^3 = 270$ and $x - y = 6$

$\because x^3 - y^3 = (x - y)\,[(x - y)^2 + 3xy]$

$\Rightarrow 270 = 6[36 + 3xy)$

$\Rightarrow 45 = 36 + 3xy$

$\Rightarrow 3xy = 9 \Rightarrow xy = 3$

$\because (x + y)^2 = (x - y)^2 + 4xy$

$\Rightarrow (x + y)^2 = 36 + 12$

$\Rightarrow (x + y) = \sqrt{48} = 4\sqrt{3}$

244. (d) $a^3 + b^3 = 218$ and $(a + b) = 2$

$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$

$\Rightarrow 218 = 2[2^2 - 3ab]$

$\Rightarrow 105 = -3ab$

$\Rightarrow ab = -35$

$\therefore \sqrt{1 - ab} = \sqrt{1 - (-35)} = 6$

SMART APPROACH:-

$a^3 + b^3 = 218,\ a + b = 2$

Here, $a = 7,\ b = -5$ satisfied.

$\therefore \sqrt{1 - ab} = \sqrt{1 - 7 \times (-5)}$

$= \sqrt{1 + 35} = 6$

245. (b) $x - y = 11,\ \dfrac{1}{x} - \dfrac{1}{y} = \dfrac{11}{24}$

$\Rightarrow \dfrac{y - x}{xy} = \dfrac{11}{24} \Rightarrow xy = -24$

Also $(x^3 - y^3) = (x - y)^3 + 3xy\,(x - y$

$= 1331 - 72\,(11)$

$= 1331 - 792 = 539$

$\therefore x^3 - y^3 + x^2y^2 = 539 + (-24)^2$

$= 539 + 576 = 1115$

Alternate Method:

$x - y = 11$

Put $x = 8$ and $y = -3$

$x^3 - y^3 + x^2y^2 = 512 + 27 + 64 \times 9$

$= 512 + 27 + 576 = 1115$

246. (d) $(3x - 4)^3 = (3x)^3 - (4)^3 - 3 \times 3x \times 4\,(3x - 4)$

$= 27x^3 - 64 - 36x\,(3x - 4)$

$= 27x^3 - 64 - 108x^2 + 144x$

Coefficient of x is 144

247. (c) $\left[5x^2 - \dfrac{1}{x}\right]^3 = (5x^2)^3 - \left(\dfrac{1}{x}\right)^3$

$-3 \times 5x^2 \times \dfrac{1}{x}\left[5x^2 - \dfrac{1}{x}\right]$

$= 125x^6 - \dfrac{1}{x^3} - 75x^3 + 15$

Constant term $= 15$

248. (c) $(4x + 2y)^3 + (4x - 2y)^3$

$= 16(Ax^3 + Bxy^2)$ ....(i)

$[(A + B)^3 + (A - B)^3 = A^3 + B^3 + 3A^2B + 3AB^2 + A^3 - B^3 - 3A^2B + 3AB^2$

$= 2A^3 + 6AB^2]$

$\therefore (4x + 2y)^3 + (4x - 2y)^3 = 2 \times (4x)^3 + 6 \times 4x \times (2y)^2$

$= 128x^3 + 96xy^2$

$= 16(8x^3 + 6xy^2)$ ....(ii)

Comparing equation (i) and (ii),

$A = 8,\ B = 6$

$\therefore \dfrac{1}{2}\left(\sqrt{A^2 + B^2}\right) = \dfrac{1}{2}\left(\sqrt{64 + 36}\right) = \dfrac{10}{2} = 5$

249. (a) Given,

$a^3 + 3a^2 + 3a = 7$

$\Rightarrow a^3 + 3a^2 + 3a + 1 = 8$

$\Rightarrow (a + 1)^3 = 8$

$\Rightarrow a + 1 = 2 \Rightarrow a = 1$

$\therefore a^2 + 2a = 1 + 2 = 3$

Alternate Method:

Put $a = 1$

now, $a^2 + 2a = 1 + 2 = 3$

250. (d) $[x^3 - y^3 = (x - y)(x^2 + y^2 + xy)]$

$2\sqrt{2}x^3 - 3\sqrt{3}y^3$

$= (\sqrt{2}x - \sqrt{3}y)(2x^2 + \sqrt{6}xy + 3y^2)$

Compare it with $(Ax^2 - Bxy + Cy^2)$

$A = 2, B = -\sqrt{6}$ & $C = 3$

$\therefore (A^2 + B^2 + C^2) = 2^2 + (\sqrt{6})^2 + 3^2$

$= 4 + 6 + 9 = 19$

251. (b) $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)$

$\times (Ax^2 + By^2 + Cxy)$

$\Rightarrow (\sqrt{2}x)^3 - (\sqrt{3}y)^3 = (\sqrt{2}x - \sqrt{3}y)$

$\times (Ax^2 + By^2 + Cxy)$

$\Rightarrow (\sqrt{2}x - \sqrt{3}y)(2x^2 + 3y^2 + \sqrt{6}xy)$

$= (\sqrt{2}x - \sqrt{3}y)\ (Ax^2 + By^2 + Cxy)$

$\Rightarrow 2x^2 + 3y^2 + \sqrt{6}xy = Ax^2 + By^2 + Cxy$

$\therefore A = 2, B = 3, C = \sqrt{6}$

$A^2 + B^2 - C^2 = 2^2 + 3^2 - (\sqrt{6})^2$

$= 4 + 9 - 6 = 7$

252. (b) $27x^3 - 64y^3 = (3x - 4y)(9x^2 + 16y^2 + 12xy)$

On comparing with $(Ax + By)(Cx^2 - Dy^2 + 12xy)$

$A = 3, B = -4, C = 9, D = -16$

Now,

$4A + B + 3C + 2D$

$= 4 \times 3 - 4 + 9 \times 3 - 16 \times 2$

$= 12 - 4 + 27 - 32 = 3$

253. (d) We know that,

$\dfrac{p^3 + q^3}{(p + q)} = p^2 + q^2 - pq$

$\dfrac{(54\sqrt{2}x^3 + 24\sqrt{3}y^3)}{\sqrt{18}x + \sqrt{12}y}$

$= 18x^2 + 12y^2 + 6\sqrt{6}\,xy$

On comparison from $Ax^2 + By^2 + Cxy$

$\Rightarrow A = 18, B = 12, C = 6\sqrt{6}$

$\therefore A^2 - (B^2 + C^2)$

$= 324 - (144 + 216)$

$= -36$

254. (c) $\dfrac{8x^3 - 27y^3}{2x - 3y} = \dfrac{(2x)^3 - (3y)^3}{(2x - 3y)}$

$= \dfrac{(2x - 3y)(4x^2 + 9y^2 + 6xy)}{2x - 3y}$

$Ax^2 + Bxy + Cy^2 = 4x^2 + 6xy + 9y^2$

By comparison

$A = 4, B = 6, C = 9$

$\therefore 2A + B - C = 2 \times 4 + 6 - 9$

$= 14 - 9 = 5$

255. (c) $8(x + y)^3 - 27(x - y)^3 = (5y - x)(Ax^2 + By^2 + Cxy)$

Let, $A = 2x + 2y$

$B = 3x - 3y$

$A - B = 5y - x$

$A^3 - B^3 = (5y - x)[(2x + 2y)^2 + (3x - 3y)^2 + (2x + 2y)(3x - 3y)]$

$= (5y - x)[4x^2 + 4y^2 + 8xy + 9x^2 + 9y^2 - 18xy + 6x^2 - 6xy + 6xy - 6y^2]$

$= (5y - x)[19x^2 + 7y^2 - 10xy]$

$A = 19, B = 7, C = -10$

$\therefore A + B - C = 19 + 7 + 10 = 36$

256. (b) $27(x + y)^3 - 8(x - y)^3 = (x + 5y)(Ax^2 + By^2 + Cxy)$

Let $x = 1$ and $y = -1$

$\Rightarrow 27(1 - 1)^3 - 8(1 + 1)^3 = (1 - 5)(A + B - C)$

$\Rightarrow -8 \times 8 = -4\ (A + B - C)$

$\Rightarrow (A + B - C) = 16$

257. (b) $(a - 18)^2 + (b - 12)^2 + (c - 6)^2 = 0$

$\Rightarrow a = 18\ ;\ b = 12\ ;\ c = 6$

$\therefore (a + b + c)^{\frac{1}{2}} = (36)^{\frac{1}{2}} = \pm 6$

258. (a) $x^2 + 4y^2 + 2x + 1 = 0$

$\Rightarrow (x + 1)^2 + (2y)^2 = 0$

$\Rightarrow x + 1 = 0 \Rightarrow\ x = -1$

$2y = 0 \Rightarrow\ y = 0$

$\therefore x^{39} + y^{36} = (-1)^{39} + (0)^{36} = -1$

259. (b) $a^2 + b^2 + c^2 = 2(a + c - 1)$

$\Rightarrow a^2 + b^2 + c^2 - 2a - 2c + 2 = 0$

$\Rightarrow (a - 1)^2 + (c - 1)^2 + b^2 = 0$

$\Rightarrow a = 1, c = 1, b = 0$

$\therefore a^3 + b^3 + c^3 = 1^3 + 0 + 1^3 = 2$

Alternate Method:

$a^2 + b^2 + c^2 = 2(a + c - 1)$

Putting value $a = 1, b = 0, c = 1$

$2 = 2$(satisfied)

$\therefore a^3 + b^3 + c^3 = 1^3 + 0 + 1^3 = 2$

260. (c) $x^2 + y^2 + z^2 = 2(x + z - 1)$

$\Rightarrow x^2 - 2x + 1 + y^2 + z^2 - 2z + 1 = 0$

$\Rightarrow (x - 1)^2 + y^2 + (z - 1)^2 = 0$

$\Rightarrow x = 1, y = 0, z = 1$

$\therefore x^3 + y^3 + z^3 = 1 + 0 + 1 = 2$

Alternate Method:

$(ax^2 + by^2 + cz^2) + k = 2(Px + Qy + Rz)$

$x = \dfrac{P}{a},\ y = \dfrac{Q}{b},\ z = \dfrac{R}{c}$

$x^2 + y^2 + z^2 = 2(x + z - 1)$

$x = \dfrac{\text{Coff. of } x}{\text{Coff. of } x^2} = \dfrac{1}{1} = 1, y = 0, z = 1$

$\therefore x^3 + y^3 + z^3 = 1 + 0 + 1 = 2$

261. (d) $x^2 + y^2 + 2y + 4x + 5 = 0$

$\Rightarrow x^2 + 4x + 4 + y^2 + 2y + 1 = 0$

$\Rightarrow (x + 2)^2 + (y + 1)^2 = 0$

$\Rightarrow x = -2, y = -1$

$\therefore \dfrac{x + y}{x - y} = \dfrac{-3}{-1} = 3$

Alternate Method:

$x^2 + y^2 = -4x - 2y - 5$

$\Rightarrow x^2 + y^2 = 2(-2x - y) - 5$

$\Rightarrow x = \dfrac{-2}{1} = -2, y = -1$

$\therefore \dfrac{x + y}{x - y} = \dfrac{-2 - 1}{-2 + 1} = \dfrac{-3}{-1} = 3$

262. (a) $x^2 + 8y^2 - 12y - 4xy + 9 = 0$

$\Rightarrow x^2 - 4xy + 4y^2 + 4y^2 - 12y + 9 = 0$

$\Rightarrow (x - 2y)^2 + (2y - 3)^2 = 0$

$\Rightarrow x - 2y = 0$ and $2y - 3 = 0$

$\Rightarrow x = 2y$ and $2y = 3$

$\therefore y = \dfrac{3}{2}$ and $x = 2 \times \dfrac{3}{2} = 3$

$\therefore 7x - 8y = 7 \times 3 - 8 \times \dfrac{3}{2}$

$= 21 - 12 = 9$

263. (a) $a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$

$\Rightarrow a^2 + b^2 + 49c^2 + 18 = 2b - 56c - 2a$

$\Rightarrow a^2 + 2a + b^2 - 2b + 49c^2 + 56c + 18 = 0$

$\Rightarrow (a + 1)^2 + (b - 1)^2 + (7c + 4)^2 = 0$

If $x^2 + y^2 + z^2 = 0$

Then $x = 0, y = 0$ and $z = 0]$

So,

$a + 1 = 0, b - 1 = 0, 7c + 4 = 0$

$a = -1, b = 1, c = \dfrac{-4}{7}$

$\therefore a + b - 7c$

$= -1 + 1 - 7 \times \left(\dfrac{-4}{7}\right) = 4$

Alternate Method:

Direct comparison of coefficient

$a = -1, b = 1, c = \dfrac{-28}{49} = \dfrac{-4}{7}$

Now,

$(a + b - 7c) = \left(-1 + 1 - \left(-7 \times \dfrac{4}{7}\right)\right) = 4$

264. (b) $(a + b + c)^2 - a^2 - b^2 - c^2$

$= a^2 + b^2 + c^2 + 2(ab + bc + ca) - a^2 - b^2 - c^2$

$= 2\ (ab + bc + ca)$

265. (a) $(a+b+c)^2 = a^2+b^2+c^2+ 2(ab+bc+ca)$

$\therefore (-5x)^2 + (4y)^2 + (3z)^2 + 2 \times 4y \times 3z - 2 \times 5x \times 4y - 2 \times 5x \times 3z$

$= (4y + 3z - 5x)^2$

266. (b) Given,

$a + b + c = 16$ and $a^2 + b^2 + c^2 = 90$

$(a + b + c)^2 = (a^2 + b^2 + c^2) + 2\ (ab + bc + ca)$

$\Rightarrow 256 = 90 + 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = \dfrac{256 - 90}{2} = 83$

Alternate Method:

Put $c = 0$

then, $a + b = 16$, $a^2 + b^2 = 90$, $ab = ?$

$ab = \dfrac{(a + b)^2 - (a^2 + b^2)}{2}$

$= \dfrac{256 - 90}{2} = 83$

267. (c) $(x+y+z)^2 = x^2+y^2+z^2+2(xy+yz+zx)$

$\Rightarrow (23)^2 = 179 + 2(xy + yz + zx)$

$\Rightarrow 529 - 179 = 2(xy + yz + zx)$

$\Rightarrow 350 = 2(xy + yz + zx)$

$\Rightarrow xy + yz + zx = \frac{350}{2} = 175$

268. (d) $a + b + c = 15$

$ab + bc + ca = 22$

We know that,

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow a^2 + b^2 + c^2 = 225 - 44 = 181$

Alternate Method:

Put $c = 0$, $a + b = 15$, $ab = 22$

$a^2 + b^2 = (a + b)^2 - 2ab$

$= 15^2 - 2 \times 22 = 225 - 44 = 181$

269. (d) $x + y + z = 4$,

$x^2 + y^2 + z^2 = 12$,

$\therefore (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 16 = 12 + 2(xy + yz + zx)$

$\Rightarrow xy + yz + zx = \frac{16-12}{2} = 2$

Alternate Method:

Here is three variable and two equation, So we can put the value of one variable 0.

Let $z = 0$

$x + y = 4$, $x^2 + y^2 = 12$, $xy = ?$

$\therefore (x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow (4)^2 = 12 + 2xy$

$\Rightarrow xy = 2$

270. (b) $(a + b + c)^2$

$= a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow (a + b + c)^2 = 6.25 + 2 \times 0.52 = 7.29$

$\Rightarrow a + b + c = \sqrt{7.29} = \pm 2.7$

but, $a + b + c < 0$

$\therefore a + b + c = -2.7$

271. (c) $(a + b - c)^2 = a^2 + b^2 + c^2 + 2(ab - bc - ca)$

$\Rightarrow 25 = (a^2 + b^2 + c^2) + 2 \times 10$

$\Rightarrow a^2 + b^2 + c^2 = 5$

272. (d) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$\Rightarrow 0 = 40 + 2(ab + bc + ca)$

$\Rightarrow 2(ab + bc + ca) = -40$

$\therefore 4(ab + bc + ca) = -80$

273. (d) $9a + 9b + 9c = 81$

$\Rightarrow a + b + c = 9$

$4ab + 4bc + 4ca = 160$

$\Rightarrow ab + bc + ca = 40$

$\because (a+b+c)^2 = a^2+b^2+c^2+2(ab + bc + ca)$

$\Rightarrow 81 = a^2 + b^2 + c^2 + 2 \times 40$

$\Rightarrow 1 = a^2 + b^2 + c^2$

$\therefore 6a^2 + 6b^2 + 6c^2 = 6(a^2 + b^2 + c^2) = 6$

274. (c) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$\Rightarrow (32)^2 = a^2 + b^2 + c^2 + 120$

$\Rightarrow 1024 = a^2 + b^2 + c^2 + 120$

$\Rightarrow a^2 + b^2 + c^2 = 904$

$\therefore 4(a^2 + b^2 + c^2) = 904 \times 4 = 3616$

Alternate Method:

Put $c = 0$

$a + b = 32$, $ab = 60$, $4(a^2 + b^2) = ?$

Let, $a = 30$ and $b = 2$ satisfied

$\therefore 4(a^2 + b^2) = 4(900 + 4)$

$= 4 \times 904 = 3616$

275. (b) $a^2 + b^2 + c^2 - 2ab + 2ac - 2bc$

$= (a - b + c)^2$

Now, $(x + y - x + y + 2x - 1)^2$

$= (2x + 2y - 1)^2$

276. (b) Given,

$x + y + z = 13$, $x^2 + y^2 + z^2 = 91$, $xz = y^2$

We know that,

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$\Rightarrow (13)^2 = 91 + 2(xy + yz + y^2)$

$\Rightarrow 78 = 2y(x + y + z)$

$\Rightarrow y = 3$

So, $y^2 = 9 = xz$ .....(i)

$(xy + yz + zx) = 39$

Put value $(3x + 3z + 9) = 39$

$\Rightarrow x + z = 10$ ....(ii)

From eq. (i) and (ii)

$x = 9$, $z = 1$

$\therefore x - z = 9 - 1 = 8$

SMART APPROACH:-

Let, $x = 9$, $y = 3$, $z = 1$ satisfy all the given equation

$\therefore x - z = 9 - 1 = 8$

277. (b) $(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 361 = 133 + 2(xy + yz + y^2)$

$\Rightarrow 228 = 2y(x + y + z)$

$\Rightarrow 114 = y \times 19 \Rightarrow y = 6$

$(x + 6 + z) = 19$

$(x + z) = 13$ .....(i)

$xz = y^2 = 6^2 = 36$ .....(ii)

From eq. (i) and (ii)

$x = 9$, $z = 4$

$\therefore x - z = 9 - 4 = 5$

SMART APPROACH:-

Value putting, $x = 9$, $y = 6$, $z = 4$

$\therefore x - z = 9 - 4 = 5$

278. (c) Given,

$a + b + c = 6$, $a^2 + b^2 + c^2 = 14$, $ab + bc + ca = 11$

$\therefore a^3 + b^3 + c^3 - 3abc = 6(14 - 11)$

$= 6 \times 3 = 18$

279. (d) $\frac{x^3 + y^3 + z^3 - 3xyz}{(x - y)^2 + (y - z)^2 + (z - x)^2}$

$= \frac{(x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)}{2(x^2 + y^2 + z^2 - xy - yz - zx)}$

$= \frac{x + y + z}{2}$

280. (d) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$\Rightarrow (a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$

$(a + b + 2c) = a^3 + b^3 + 8c^3 - 6abc$

281. (d) $a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$

$= 15[(15)^2 - 3 \times 35]$

$= 15(225 - 105)$

Using digital sum

$6(9 - 6) = 6 \times 3 = 18 = 9$

For option, DS of 1800 = 9

Alternate Method:

Put $c = 0$

$a + b + c = 15 \Rightarrow a + b = 15$

and,

$ab + bc + ca = 35 \Rightarrow ab = 35$

and,

$a^3 + b^3 + c^3 - 3abc = a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

$= (15)^3 - 3 \times 35 \times 15 = 3375 - 1575 = 1800$

Using digital sum

$9 - 9 = 0$ or 9

$\therefore$ From option DS of 1800 is '9'.

(***Note:-*** use digital sum method to avoid calculation)

282. (d) $a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$

$= 13[(13)^2 - 3(22)]$

$= 13(169 - 66)$

$= 13 \times 103 = 1339$

Using digital sum

$4[7 - 3] = 7$

From option DS of 1339 is 7

Note:- Go through unit digit

Alternate Method:

Put $c = 0$

$a + b = 13$, $ab = 22$

$\Rightarrow a = 11$, $b = 2$

$\therefore a^3 + b^3 + c^3 - 3abc$

$= a^3 + b^3 = 11^3 + 2^3$

$= 1331 + 8 = 1339$

283. (a) $a + b + c = 5$, $ab + bc + ac = 7$

$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ac)]$

$= 5[25 - 3 \times 7]$

$= 5 \times 4 = 20$

284. (d) $a + b + c = 14$

$a^3 + b^3 + c^3 - 3abc = 98$

$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ac)]$

$\Rightarrow 98 = 14[196 - 3 \times (ab + bc + ac)]$

$\Rightarrow 7 = [196 - 3(ab + bc + ac)]$

$\Rightarrow -189 = -3(ab + bc + ac)$

$\Rightarrow ab + bc + ac = 63$

285. (b) $a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$

$= 12[12^2 - 3 \times 22] = 12[144 - 66]$

$= 12 \times 78 = 936$

Alternate Method:

Put $c = 0$

$a + b = 12$, $ab = 22$

$a^3 + b^3 = ?$

$(a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow 144 = a^2 + b^2 + 44$

$\Rightarrow a^2 + b^2 = 100$

$\therefore a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$

$= 12(100 - 22) = 12 \times 78 = 936$

286. (b) $x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$

$\Rightarrow x^3 + y^3 + z^3 - 3 \times (-1) = 1[(1)^2 - 3(-1)]$

$\Rightarrow x^3 + y^3 + z^3 + 3 = 4$

$\Rightarrow x^3 + y^3 + z^3 = 1$

Alternate Method:

Put $x = y = 1, z = -1$

$x^3 + y^3 + z^3 = 1 + 1 - 1 = 1$

287. (c) Given,

$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$

$\Rightarrow a^3 + b^3 + c^3 - 3 \times (-1) = 7[7^2 - 3 \times 11)$

$\Rightarrow a^3 + b^3 + c^3 = 7 \times (49 - 33) - 3$

$= 112 - 3 = 109$

288. (a) Given,

$a + b + c = 20$

$a^2 + b^2 + c^2 = 152$

Then,

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 400 = 152 + 2(ab + bc + ca)$

$\Rightarrow 248 = 2(ab + bc + ca)$

$\Rightarrow 124 = ab + bc + ca$

$\therefore a^3 + b^3 + c^3 - 3abc = (a + b + c)[a^2 + b^2 + c^2 - (ab + bc + ca)]$

$= 20[152 - 124]$

$= 20[28] = 560$

Alternate Method:

Here is three variable and two equation. So we can put the value of one variable 0.

Let, $c = 0$

$a + b = 20, a^2 + b^2 = 152, a^3 + b^3 = ?$

$(a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow 400 = 152 + 2ab$

$\Rightarrow ab = \frac{248}{2} = 124$

$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$

$= 20[20^2 - 3 \times 124] = 560$

Using DS, $2(4 - 3) = 2$

Option (a) 560 has DS = '2'

SMART APPROACH:-

$a^3 + b^3 + c^3 - 3abc = \frac{a + b + c}{2}[3(a^2 + b^2 + c^2) - (a + b + c)^2]$

$= \frac{20}{2}[3 \times 152 - 20^2]$

Using DS

$= 1[6 - 4] = 2$

$= 10 \times [456 - 400] = 560$

From options 560 has DS = 2

289. (a) $a + b + c = 12$,

$a^2 + b^2 + c^2 = 50$,

$\Rightarrow (a + b + c)^2$

$= a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 144 = 50 + 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = 47$

$\therefore a^3 + b^3 + c^3 - 3abc$

$= (a + b + c)[(a^2 + b^2 + c^2 - (ab + bc + ca)]$

$= 12[50 - 47] = 12 \times 3 = 36$

Alternate Method:

Here is 3 variable and 2 equation so we can put the value of any one variable 0.

Let $c = 0$

$a + b = 12, a^2 + b^2 = 50, a^3 + b^3 = ?$

$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$

$= 12[12^2 - 3 \times 47]$

$= 12 \times 3 = 36$

SMART APPROACH:-

$a^3 + b^3 + c^3 - 3abc = \frac{a + b + c}{2}[3(a^2 + b^2 + c^2) - (a + b + c)^2]$

$= \frac{12}{2}[3 \times 50 - 12^2]$

$= 6 \times (150 - 144)$

$= 36$

290. (b) $x + y + z = 18$

$x^2 + y^2 + z^2 = 36$

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 324 = 36 + 2(xy + yz + zx)$

$\Rightarrow xy + yz + zx = 144$

$\therefore x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$

$= 18[324 - 432] = 18 \times (-108)$

$= -1944$

Alternate Method:

Put,

$z = 0 \Rightarrow x + y = 18, x^2 + y^2 = 36$

$(x + y)^2 = x^2 + y^2 + 2xy \Rightarrow 324 = 36 + 2xy \Rightarrow xy = 144$

$x^3 + y^3 = (x + y)^3 - 3xy(x + y) = (18)^3 - 3 \times 144 \times 18$

$= 5832 - 7776 = -1944$

291. (a) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 5^2 = 15 + 2(ab + bc + ca)$

$\Rightarrow 10 = 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = 5$

$\therefore a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ac]$

$= 5[(5)^2 - 3 \times 5] = 5[25 - 15] = 50$

$\therefore a^3 + b^3 + c^3 - 3abc - 27$

$= 50 - 27 = 23$

Alternate Method:

$a^3 + b^3 + c^3 - 3abc - 27 = \frac{a + b + c}{2}[3(a^2 + b^2 + c^2) - (a + b + c)^2] - 27$

$= \frac{5}{2}[3 \times 15 - (5)^2] - 27$

$= \frac{5}{2} \times 20 - 27 = 50 - 27 = 23$

292. (c) $x + y + z = 2$

$x^3 + y^3 + z^3 - 3xyz = 74$

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[2^2 - 3(xy + yz + zx)]$

$\Rightarrow 74 = 2[4 - 3(xy + yz + zx)]$

$\Rightarrow -11 = xy + yz + zx$

Now,

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 4 = x^2 + y^2 + z^2 + (-2 \times 11)$

$\Rightarrow x^2 + y^2 + z^2 = 26$

293. (d) $a = 355, b = 356, c = 357$

$a^3 + b^3 + c^3 - 3abc = \frac{a + b + c}{2}[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$= \frac{1068}{2}[1^2 + 1^2 + 4]$

$= 3 \times 1068 = 3204$

Alternate Method:

Direct formula $= 9bd^2$

where b = middle term

d = diff of AP series

$\Rightarrow 9 \times 356 \times (1)^2 = 3204$

294. (a) $x^3 + y^3 + z^3 - 3xyz$

$= \frac{x + y + z}{2}[(x - y)^2 + (y - z)^2 + (z - x)^2]$

$= \frac{110 + 111 + 112}{2}[(110 - 111)^2 + (111 - 112)^2 + (112 - 110)^2]$

$= \frac{110 + 111 + 112}{2} \times 6 = 333 \times 3$

$= 999$

Alternate Method:

When a, b and c are consecutive natural number then $a^3 + b^3 + c^3 - 3abc = 9bd^2$

where, b = middle number

and d = common difference

$\Rightarrow 9 \times 111 \times 1^2 = 999$

295. (c) $a = 2022, b = 2021, c = 2020$

$a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2}[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$= \frac{1}{2}[1^2 + 1^2 + 2^2]$

$= \frac{1}{2} \times 6 = 3$

SMART APPROACH:-

When numbers are in A.P then

$a^2 + b^2 + c^2 - ab - bc - ca = 3d^2$

Where, d = diff.

$\Rightarrow 3 \times 1^2 = 3$

296. (c) $a = 335, b = 215, c = 180$

$a^3 + b^3 + c^3 - 3abc$

$= \frac{(a + b + c)}{2}\left[(a - b)^2 + (b - c)^2 + (c - a)^2\right]$

$= \frac{730}{2} \times \left[(120)^2 + (35)^2 + (155)^2\right]$

$= 365[14400 + 1225 + 24025]$

$= 365 \times [39650] = 14472250$

Note: By digital sum option (c) satisfies

297. (b) $a^3 + b^3 + c^3 - 3abc = 405$,

$a + b + c = 15$

$\therefore a^3 + b^3 + c^3 - 3abc$

$= (a + b + c) \times \frac{1}{2}[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$\Rightarrow 405 = \frac{15}{2} \times [(a - b)^2 + (b - c)^2 + (c - a)^2]$

$\Rightarrow \frac{810}{15} = (a - b)^2 + (b - c)^2 + (c - a)^2$

$\therefore (a - b)^2 + (b - c)^2 + (c - a)^2 = 54$

298. (a) We know that,

$(a^3 + b^3 + c^3 - 3abc)$

$= \frac{(a + b + c)}{2}\left[(a - b)^2 + (b - c)^2 + (c - a)^2\right]$

$\Rightarrow 405 = \frac{(a + b + c)}{2} \times 54$

$\Rightarrow (a + b + c) = \frac{405}{27} = 15$

299. (b) $\{a^3 + b^3 + c^3 - 3abc\} = (a + b + c)$

$\frac{1}{2}\{(a-b)^2 + (b-c)^2 + (c-a)^2\}$

Multiply by 2 both side,

$2a^3 + 2b^3 + 2c^3 - 6abc = (a + b + c)$
$\{(a-b)^2 + (b-c)^2 + (c-a)^2\}$

300. (a) $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)$
$[(x-y)^2 + (y-z)^2 + (z-x)^2]$

$\Rightarrow \frac{1}{2} \times 98[(1.6)^2 + (3.7)^2 + (2.1)^2] = 0.98k$

$\Rightarrow \frac{98}{2}[2.56 + 13.69 + 4.41] = 0.98k$

$\Rightarrow 49 \times 20.66 = 0.98k$

$\Rightarrow k = \frac{4900}{98} \times 20.66$

$\Rightarrow k = 50 \times 20.66 = 1033$

301. (c) If $(a + b + c) = 0$

Then, $a^3 + b^3 + c^3 = 3abc$

302. (b) [If $x + y + z = 0$ then
$x^3 + y^3 + z^3 = 3xyz$]

$\therefore \frac{x}{(yz)^2} + \frac{y}{(xz)^2} + \frac{z}{(xy)^2} = \frac{x^3 + y^3 + z^3}{(xyz)^2}$

$= \frac{3xyz}{(xyz)^2} = \frac{3}{xyz}$

303. (a) If $a + b + c = 0$,

Then,

$a^3 + b^3 + c^3 = 3abc$

$a = x - y,\ b = y - z,\ c = z - x$

$\therefore a + b + c = x - y + y - z + z - x = 0$

$\therefore \frac{a^3 + b^3 + c^3}{abc} = \frac{3abc}{abc} = 3.$

304. (a) We know that,

$a + b + c = 0$

Then, $a^3 + b^3 + c^3 = 3abc$

$u - v + v - w + w - u = 0$

$(u-v)^3 + (v-w)^3 + (w-u)^3$

$= 3(u-v)(v-w)(w-u)$

$\therefore \frac{(u-v)^3 + (v-w)^3 + (w-u)^3}{(u^2-v^2)^3 + (v^2-w^2)^3 + (w^2-u^2)^3}$

$= \frac{3(u-v)(v-w)(w-u)}{3(u^2-v^2)(v^2-w^2)(w^2-u^2)}$

$= \frac{1}{(u+v)(v+w)(w+u)}$

305. (a) $\frac{5[(a^6-b^6)^3 + (b^6-c^6)^3 + (c^6-a^6)^3]}{2[(a^3-b^3)^3 + (b^3-c^3)^3 + (c^3-a^3)^3]}$

We know,

If, $a + b + c = 0$

Then, $a^3 + b^3 + c^3 = 3abc$

$= \frac{5}{2}\left[\frac{3 \times (a^6-b^6)(b^6-c^6)(c^6-a^6)}{3 \times (a^3-b^3)(b^3-c^3)^3(c^3-a^3)}\right]$

$= \frac{5}{2}(a^3 + b^3)(b^3 + c^3)(c^3 + a^3)$

306. (b) $\frac{(a^2-4b^2)^3 + 64(b^2-4c^2)^3 + (16c^2-a^2)^3}{(a-2b)^3 + (2b-4c)^3 + (4c-a)^3}$

$= \frac{(a^2-4b^2)^3 + (4b^2-16c^2)^3 + (16c^2-a^2)^3}{(a-2b)^3 + (2b-4c)^3 + (4c-a)^3}$ ..(i)

Let,

$x = a - 2b,\ y = 2b - 4c,\ z = 4c - a$

Consider,

$x + y + z = a - 2b + 2b - 4c + 4c - a = 0$

$\Rightarrow x^3 + y^3 + z^3 = 3xyz$

$\therefore$ Equation (i) become

$= \frac{3(a^2-4b^2)(4b^2-16c^2)(16c^2-a^2)}{3(a-2b)(2b-4c)(4c-a)}$

$= \frac{(a-2b)(a+2b)(2b-4c)(2b+4c)(4c-a)(4c+a)}{(a-2b)(2b-4c)(4c-a)}$

$= (a + 2b)(2b + 4c)(4c + a)$

$= 2(a + 2b)(b + 2c)(4c + a)$

307. (a)

$$\begin{array}{ll} & a + b = c \\ & \downarrow \quad \downarrow \quad \downarrow \\ \text{Put} \rightarrow & ① \quad ① \quad ② \end{array}$$

$a^3 + b^3 - c^3 + 3abc$

$= 1 + 1 - 8 + 3 \times 1 \times 1 \times 2$

$= 2 - 8 + 6 = 8 - 8 = 0$

Alternate method:-

If $a + b - c = 0$

Then,

$a^3 + b^3 - c^3 + 3abc = 0$

308. (a) If $a + 2b + 3c = 0$

then,

$a^3 + 8b^3 + 27c^3 = 3(a \times 2b \times 3c)$

$= 18abc$

309. (d) $8a^3 + b^3 + 27c^3 = 18abc$

$\Rightarrow (2a)^3 + b^3 + (3c)^3 - 3 \times 2a \times b \times 3c = 0$

$\Rightarrow 2a + b + 3c = 0$

$\Rightarrow b + 3c = -2a$

310. (a) We know that,

$a^3 + b^3 + c^3 - 3abc = 0$

Then, $a + b + c = 0$

$\Rightarrow (5x + 1)^3 + (x - 3)^3 + [2(3x - 4)]^3 - 3(5x + 1)(x - 3)\,2(3x - 4) = 0$

Now,

$5x + 1 + x - 3 + 6x - 8 = 0$

$\Rightarrow 12x - 10 = 0$

$\therefore x = \frac{5}{6}$

311. (d) If $A^3 + B^3 + C^3 = 3ABC$

Then,

$A + B + C = 0$

$(x + 6)^3 + (2x + 3)^3 + (3x + 5)^3$

$= 3(x + 6)(2x + 3)(3x + 5)$

$\Rightarrow x + 6 + 2x + 3 + 3x + 5 = 0$

$\Rightarrow 6x = -14$

$\Rightarrow x = -\frac{7}{3}$

312. (b) If $a^3 + b^3 + c^3 = 3abc$ then $a + b + c = 0$

$(5x - 3)^3 + (2x + 5)^3 + 27(4 - 3x)^3$

$= 9(3 - 5x)(2x + 5)(3x - 4)$

$\Rightarrow (5x - 3)^3 + (2x + 5)^3 + (12 - 9x)^3$

$= 3(5x - 3)(2x + 5)(12 - 9x)$

$\Rightarrow 5x - 3 + 2x + 5 + 12 - 9x = 0$

$\Rightarrow -2x = -14 \Rightarrow x = 7$

$\therefore 2x + 1 = 2 \times 7 + 1 = 14 + 1 = 15$

313. (a) $ab + bc + ca = 8,\ a^2 + b^2 + c^2 = 20$

$(a + b + c) = \sqrt{36} = 6$

$\therefore \frac{1}{2}(a + b + c)[(a-b)^2 + (b-c)^2 + (c-a)^2]$

$= \frac{1}{2}(a + b + c) \times 2[a^2 + b^2 + c^2 - ab - bc - ac]$

$= (a + b + c)[20 - 8]$

$= 6 \times 12 = 72$

Alternate Method:-

put $c = 0,\ a = 4,\ b = 2$

$\therefore \frac{1}{2}(a + b + c)[(a-b)^2 + (b-c)^2 + (c-a)^2] = \frac{1}{2} \times 6 \times (2^2 + 4^2 + 2^2)$

$= 3 \times 24 = 72$

314. (a) $a + b + c = 19,\ a^2 + b^2 + c^2 = 155$

$\therefore 2(ab + bc + ac) = 19^2 - 155 = 361 - 155 = 206$

$\Rightarrow ab + bc + ac = 103$

$(a-b)^2 + (b-c)^2 + (c-a)^2$

$= 2[a^2 + b^2 + c^2 - (ab + bc + ac)]$

$= 2[155 - 103]$

$= 2 \times 52 = 104$

315. (b) $(a + b + c)^2$

$= a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 289 - 101 = 2(ab + bc + ca)$

$\Rightarrow \frac{188}{2} = ab + bc + ca$

$\Rightarrow ab + bc + ca = 94$

$\therefore (a-b)^2 + (b-c)^2 + (c-a)^2$

$= 2 \times (a^2 + b^2 + c^2 - ab - bc - ca)$

$= 2 \times (101 - 94) = 7 \times 2 = 14$

Alternate Method:

Put $c = 0,\ a + b = 17,\ a^2 + b^2 = 101$

$(a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow 289 = 101 + 2ab$

$\Rightarrow ab = 94$

$\therefore (a-b)^2 + (b-c)^2 + (c-a)^2$

$= a^2 + b^2 - 2ab + b^2 + a^2 = 2 \times 101 - 2 \times 94 = 202 - 188 = 14$

316. (d) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 36 = 14 + 2(ab + bc + ca)$

$\Rightarrow \frac{22}{2} = ab + bc + ca$

$\Rightarrow 11 = ab + bc + ca$

$\therefore (a-b)^2 + (b-c)^2 + (c-a)^2$

$= 2 \times [a^2 + b^2 + c^2 - (ab + bc + ca]$

$= 2[14 - 11] = 6$

317. (d) $p = 106,\ q = 105,\ r = 104$

$\because p^2 + q^2 + r^2 - pq - qr - rp$

$= \frac{1}{2}\{(p-q)^2 + (q-r)^2 + (r-p)^2\}$

If there is common difference in given values then:

$\Rightarrow p^2 + q^2 + r^2 - pq - qr - rp = 3d^2$

ATQ, common difference = 1

$\therefore 3d^2 = 3 \times (1)^2 = 3$

318. (c) Given,

$a = 101,\ b = 102,\ c = 103,$

Diff. $= 102 - 101 = 1$

Then,

$a^2 + b^2 + c^2 - ab - bc - ca$

$= 3 \times d^2 = 3 \times 1 = 3$

Alternate Method:

$a^2 + b^2 + c^2 - ab - bc - ca$

$= \frac{(a-b)^2 + (b-c)^2 + (c-a)^2}{2}$

$= \frac{1^2 + 1^2 + 2^2}{2} = \frac{6}{2} = 3$

19. (c) $a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2}$
$[(a-b)^2 + (b-c)^2 + (c-a)^2]$
$\because a = 2022, b = 2021, c = 2020$
$\therefore a^2 + b^2 + c^2 - ab - bc - ca$
$= \frac{1}{2}[1 + 1 + 4] = 3$

SMART APPROACH:-
a = 2022, b = 2021 and c = 2020
are in A.P.
So, $a^2 + b^2 + c^2 - ab - bc - ca$
$= 3 \times d^2 = 3 \times 1 = 3$
(Where d = difference between numbers)

20. (a) $p + q + r = pqr$
And $pq + qr + rp = pqr$
$\therefore (p + q + r)^2 = p^2 + q^2 + r^2 + 2(pq + qr + rp)$
$\Rightarrow 1 = p^2 + q^2 + r^2 + 2 \times 1$
$\Rightarrow p^2 + q^2 + r^2 = -1$
$\therefore p^3 + q^3 + r^3 - 3pqr = (p + q + r)[(p^2 + q^2 + r^2 - (pq + qr + rp)]$
$\Rightarrow p^3 + q^3 + r^3 - 3 \times 1 = 1[-1 - 1]$
$\Rightarrow p^3 + q^3 + r^3 - 3 = -2$
$\Rightarrow p^3 + q^3 + r^3 = 1$

Alternate Method:
$p + q + r = 1, pqr = 1,$
$pq + qr + pr = pqr = 1$
$p^3 + 3q^3 + r^3 - 3pqr = (p + q + r)[(p + q + r)^2 - 3(pq + qr + pr)]$
$\Rightarrow p^3 + q^3 + r^3 - 3 = (1 - 3)$
$\Rightarrow p^3 + q^3 + r^3 = -2 + 3 = 1$

(d) $a = 2, b = 3$
$(4a + 3b)(16a^2 - 12ab + 9b^2)$
$= (4a)^3 + (3b)^3$
$[\because a^3 + b^3 = (a + b)(a^2 + b^2 - ab)]$
$= (4 \times 2)^3 + (3 \times 3)^3$
$= 512 + 729 = 1241$

22. (d) $(3x^3 + 5x^2y + 12xy^2 + 7y^3)$
Put $x = -4, y = -1$
$\Rightarrow 3(-4)^3 + 5(-4)^2(-1) + 12(-4)(-1)^2 + 7(-1)^3$
$= -192 - 80 - 48 - 7 = -327$

23. (d) $64x^3 + 38x^2y + 20xy^2 + y^3$
$= (4x + y)^3 - 10x^2y + 8xy^2$
Put $x = 3, y = -4$
$\Rightarrow (12 - 4)^3 - 10 \times 9 \times (-4) + 8 \times 3 \times 16$
$= 512 + 360 + 384 = 1256$

24. (d) $(a^3 - b^3 - 3a^2b + 3ab^2)$
$= (a - b)^3 = (17 - 13)^3 = 4^3 = 64$

325. (d) $27x^3 - 58x^2y + 31xy^2 - 8y^3$
Put $x = -5, y = -7$
$\Rightarrow 27(-5)^3 - 58(-5)^2(-7) + 31(-5)(-7)^2 - 8(-7)^3$
$= -3375 + 10150 - 7595 + 2744 = 1924$
From options: DS of 1924 is '7'

Alternate Method:
$27x^3 - 58x^2y + 31xy^2 - 8y^3$
$= (3x - 2y)^3 - 4x^2y - 5xy^2$
Put $x = -5$ and $y = -7$
$\Rightarrow [-3 \times 5 - 2 \times (-7)]^3 - 4 \times 25 \times (-7) - 5 \times (-5) \times 49$
$= [-15 + 14]^3 + 700 + 1225$
$= -1 + 1925 = 1924$

326. (c) $\frac{(x^3 - y^3)}{(x^2 - y^2)} - \frac{3xy}{(x + y)}$
$= \frac{(x - y)(x^2 + y^2 + xy)}{(x - y)(x + y)} - \frac{3xy}{(x + y)}$
$= \frac{x^2 + y^2 + xy - 3xy}{(x + y)}$
$= \frac{(x - y)^2}{(x + y)} = \frac{(7 - 2)^2}{7 + 2} = \frac{25}{9}$

Alternate Method:
$\frac{(x^3 - y^3)}{(x^2 - y^2)} - \frac{3xy}{(x + y)} = \frac{343 - 8}{49 - 4} - \frac{42}{9}$
$= \frac{335}{45} - \frac{42}{9} = \frac{67}{9} - \frac{42}{9} = \frac{25}{9}$

327. (c) $\left(\frac{4}{x} + y\right)\left(\frac{16}{x^2} + y^2 - \frac{4y}{x}\right) = \left(\frac{4}{x}\right)^3 + (y)^3$
$= \left(\frac{4}{-2}\right)^3 + (1)^3 = -8 + 1 = -7$

Alternate Method:
$x = -2, y = 1$
$\left(\frac{4}{x} + y\right)\left(\frac{16}{x^2} + y^2 - \frac{4y}{x}\right)$
$= \left(\frac{4}{-2} + 1\right)\left(\frac{16}{4} + 1 - \frac{4}{-2}\right)$
$= -1 \times (5 + 2) = -7$

328. (c) Put $a = b = 1$
So, $c = -4$
$\therefore \frac{4a^2 + 4b^2 + 4c^2}{5c^2 - 8ab} = \frac{4 + 4 + 64}{80 - 8} = \frac{72}{72} = 1$

329. (d) $x^2 + y^2 + z^2 = xy + yz + zx$
Put, $x = y = z = 1$
$\therefore \frac{10x^4 + 5y^4 + 7z^4}{13x^2y^2 + 6y^2z^2 + 3z^2x^2}$
$= \frac{10 + 5 + 7}{13 + 6 + 3} = 1$

330. (d) $a + b + c = 0$
Let $a = 1, b = 1$ then $c = -2$
$\frac{(b + c)^2}{bc} + \frac{(c + a)^2}{ac} + \frac{(a + b)^2}{ab}$
$= \frac{(-1)^2}{-2} + \frac{(-1)^2}{-2} + \frac{2^2}{1} = -\frac{1}{2} - \frac{1}{2} + 4 = 3$

331. (c) Put $\alpha = \beta = 1 ; \gamma = -2$
$\therefore \frac{3\beta^2 + \alpha^2 + \gamma^2}{2\beta^2 - \alpha\gamma}$
$= \frac{3 \times (1)^2 + (1)^2 + (-2)^2}{2 \times (1)^2 - 1 \times (-2)} = 2$

332. (a) Put $x = y = z = 1$
$\therefore \frac{17 + 9 + 16}{8 + 6 + 10} = \frac{42}{24} = 1.75$

333. (b) $(p + q + r) = 0$
Put $p = 1, q = -1, r = 0$
$\therefore \left(\frac{p^2}{p^2 - qr}\right) + \left(\frac{q^2}{q^2 - pr}\right) + \left(\frac{r^2}{r^2 - pq}\right)$
$= 1 + 1 + 0 = 2$

334. (b) $\{[(x - 5)(x - 1)] - [(9x - 1)(9x - 5)]\} \div 16x$
$= \{x^2 - x - 5x + 5 - [81x^2 - 45x - 9x + 5]\} \div 16x$
$= \{x^2 - 6x + 5 - 81x^2 + 54x - 5\} \div 16x$
$= \{-80x^2 + 48x\} \div 16x$
$= -5x + 3 = -(5x - 3)$

Alternate Method:
Put $x = 1$
$\{[(1 - 5)(1 - 1)] - [(9 \times 1 - 1)(9 \times 1 - 5)]\} \div 16 \times 1 = (-8 \times 4) \div 16 = -2$
Go through options, (b)
$-(5x - 3) = -(5 \times 1 - 3) = -2$

335. (c) $a^2 + b^2 + c^2 = ab + bc + ca,$
Let, $a = b = c = 1$
$1 + 1 + 1 = 1 + 1 + 1$
$3 = 3$
$\therefore \frac{11a^4 + 13b^4 + 15c^4}{16a^2b^2 + 19b^2c^2 + 17c^2a^2}$
$= \frac{11 + 13 + 15}{16 + 19 + 17} = \frac{39}{52} = \frac{3}{4}$

336. (a) $l + m + n = 0,$
$\because \left(\frac{l^2}{mn} + \frac{m^2}{nl} + \frac{n^2}{lm}\right)^2 = \left(\frac{l^3 + m^3 + n^3}{mnl}\right)^2$
Note: [If $a + b + c = 0$
Then, $a^3 + b^3 + c^3 = 3abc$]
$\because l + m + n = 0$
So, $l^3 + m^3 + n^3 = 3mnl$
$\Rightarrow \left(\frac{3mnl}{mnl}\right)^2 = 3^2 = 9$

SMART APPROACH:-
Put $l = 2, m = n = -1$
$\therefore \left(\frac{l^2}{mn} + \frac{m^2}{nl} + \frac{n^2}{lm}\right)^2 = \left(4 - \frac{1}{2} - \frac{1}{2}\right)^2$
$= 3^2 = 9$

337. (d) Let,
$A = (2a - 3b - c), B = (a + 2b + c)$
$(A^2 - B^2) = (A - B)(A + B)$
$= [(2a - 3b - c) - (a + 2b + c)][(2a - 3b - c) + (a + 2b + c)]$
$= [2a - a - 3b - 2b - c - c][2a - 3b - c + a + 2b + c]$
$= [a - 5b - 2c][3a - b]$
$= 3a^2 - 15ab - 6ac - ab + 5b^2 + 2bc$
$= 3a^2 + 5b^2 - 16ab + 2bc - 6ac$

Alternate Method:
Put, $a = b = c = 1$
$(2a - 3b - c)^2 - (a + 2b + c)^2$
$\Rightarrow (2 - 3 - 1)^2 - (1 + 2 + 1)^2$
$\Rightarrow 4 - 16 = -12$
Now, we check by option (d)
$3a^2 + 5b^2 - 16ab + 2bc - 6ac$
$= 3(1)^2 + 5(1)^2 - 16 \times 1 \times 1 + 2 \times 1 \times 1 - 6 \times 1 \times 1$
$= 3 + 5 - 16 + 2 - 6 = -12$

338. (a) $a^2 + b^2 + c^2 = ab + bc + ac$
In this case $a = b = c$
$\therefore \frac{11a^4 + 13b^4 + 17c^4}{17a^2b^2 + 9b^2c^2 + 15c^2a^2}$
$= \frac{11 + 13 + 17}{17 + 9 + 15} = \frac{41}{41} = 1$

339. (c) Let, $a = 1, b = 1,$
$(a - 2b)(b - 3a) + (a + b)(a - 3b) - (b - 3a)(4a - 5b)$
Now,
$(1 - 2)(1 - 3) + (1 + 1)(1 - 3) - (1 - 3)(4 - 5)$
$= (-1)(-2) + 2(-2) - (-2)(-1)$
$= 2 - 4 - 2 = -4$
Put the value of $a = 1, b = 1$ in option (c)
$10a^2 - 14ab = 10 - 14 = -4$

340. (a) Let, $p = q = r = 1$

Then, $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3} = 1$

341. (a) Let, $a = 1, b = 1$

$ab + bc + ca = 0$

$\Rightarrow 1 + c + c = 0 \Rightarrow c = \frac{-1}{2}$

$\therefore \frac{1}{a^2 - bc} + \frac{1}{b^2 - ac} + \frac{1}{c^2 - ab}$

$= \frac{1}{1 + \frac{1}{2}} + \frac{1}{1 + \frac{1}{2}} + \frac{1}{\frac{1}{4} - 1}$

$= \frac{2}{3} + \frac{2}{3} - \frac{4}{3} = 0$

342. (b) $abc = 5$

Let, $a = 1, b = 1, c = 5$

$\frac{1}{1 + a + \frac{1}{b}} + \frac{1}{1 + b + \frac{5}{c}} + \frac{1}{1 + \frac{c}{5} + \frac{1}{a}}$

$= \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$

343. (a) Put $b = 0$, $a^2 + 0 + 1 = 2a$

$\Rightarrow a^2 - 2a + 1 = 0$

$\Rightarrow (a - 1)^2 = 0 \Rightarrow a = 1$

Therefore,

$a^4 + b^7 = 1^4 + 0^7 = 1$

344. (d) Given,

$a^2 + b^2 = 82$, $b^2 + c^2 = 65$

Assume, $a = 9$, $b = 1$ and $c = 8$

$2a + 7b - 3c = 2(9) + 7(1) - 3(8)$

$= 18 + 7 - 24 = 1$

345. (c) $\frac{X - 5Y}{X + 5Y} = \frac{7}{13} \Rightarrow \frac{X + 5Y}{X - 5Y} = \frac{13}{7}$

Using C and D rule

$\Rightarrow \frac{X}{5Y} = \frac{20}{6} \Rightarrow \frac{X}{Y} = \frac{50}{3}$

Alternate Method:

$\frac{X - 5Y}{X + 5Y} = \frac{7}{13}$

$\Rightarrow 13X - 65Y = 7X + 35Y$

$\Rightarrow 6X = 100Y$

$\Rightarrow \frac{X}{Y} = \frac{100}{6} \Rightarrow \frac{X}{Y} = \frac{50}{3}$

346. (b) $x - 2y + 2z = 16$ ....(i)

$x - y + z = 9$ ....(ii)

$2x - 3y + z = 9$ ....(iii)

Add eqⁿ (i) & (ii) subtraction from (iii) we get

$z = 4$

put $z = 4$ in eqⁿ (i) & (ii)

$x - 2y = 8$ ....(iv)

$x - y = 5$ ....(v)

$\underline{- \quad + \qquad -}$ (Subtraction eqⁿ v)

$-y = 3$

$y = -3$

347. (a) Given, $x = 11$

Consider,

$x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 1$

$= x^5 - (11 + 1)x^4 + (11 + 1)x^3 - (11 + 1)x^2 + (11 + 1)x - 1$

$= x^5 - 11x^4 - x^4 + 11x^3 + x^3 - 11x^2 - x^2 + 11x + x - 1$

Put $x = 11$

$\Rightarrow 11^5 - 11^5 - 11^4 + 11^4 + 11^3 - 11^3 - 11^2 + 11^2 + 11 - 1 = 11 - 1 = 10$

348. (d) $x = a + \frac{1}{a}$, $y = a - \frac{1}{a}$

$\sqrt{x^4 + y^4 - 2x^2y^2} = \sqrt{(x^2 - y^2)^2} = (x^2 - y^2)$

$= \left(a + \frac{1}{a}\right)^2 - \left(a - \frac{1}{a}\right)^2 = 4 \times a \times \frac{1}{a} = 4$

349. (b) $x^4 + x^2 + 25$, Let $x^2 = a$

$\Rightarrow a^2 + a + 25$

$= a^2 + 10a - 9a + 25$

$= (a + 5)^2 - \left(3\sqrt{a}\right)^2$

$= \left(a + 5 - 3\sqrt{a}\right)\left(a + 5 + 3\sqrt{a}\right)$

$= (x^2 + 5 - 3x)(x^2 + 5 + 3x)$

Alternate Method:

Put $x = 1$

$x^4 + x^2 + 25 = 1 + 1 + 25 = 27$

Go through options, (b)

$(x^2 + 3x + 5)(x^2 - 3x + 5)$

$= (1 + 3 + 5)(1 - 3 + 5)$

$= 9 \times 3 = 27$

350. (a) $x^2 + 4y^2 + 4y - 4xy - 2x - 8$

$\Rightarrow x^2 + 4y^2 - 4xy + 4y - 2x - 8$

$\Rightarrow (x - 2y)^2 - 2(x - 2y) - 8$

Let,

$x - 2y = a$

$\Rightarrow a^2 - 2a - 8$

$\Rightarrow a^2 - 4a + 2a - 8$

$\Rightarrow a(a - 4) + 2(a - 4)$

$\Rightarrow (a - 4)(a + 2)$

Hence factor are $(x - 2y - 4)(x - 2y + 2)$

351. (a) $\because x-2$ is a factor of $2x^2+12kx-25k$

Then, $x = 2$ satisfy the polynomial

$2x^2 + 12kx - 25k = 0$

$\Rightarrow 2 \times 4 + 12 \times k \times 2 - 25k = 0$

$\Rightarrow k = 8$

352. (b) Squaring, we get

$(mx + n)^2 = m^2 x^2 + n^2 + 2\,mnx$

Alternate Method:

Go through the option-

Option (b) is the square of $(mx + n)$

Hence, $mx + n$ is a factor of $m^2x^2 + 2mnx + n^2$.

353. (b) $a^4 + b^4 + a^2b^2 = 273$, $a^2 + b^2 - ab = 21$ .....(i)

We know,

$(a^4 + b^4 + a^2b^2) = (a^2 + b^2 - ab)(a^2 + b^2 + ab)$

$\Rightarrow a^2 + b^2 + ab = \frac{273}{21}$

$\Rightarrow a^2 + b^2 + ab = 13$ .....(ii)

By equ. (i) and (ii)

$a^2 + b^2 = 17$, $ab = -4$

$\therefore \frac{1}{a} + \frac{1}{b} = \frac{a + b}{ab}$

$= \frac{\sqrt{a^2 + b^2 + 2ab}}{-4} = \frac{\sqrt{17 - 8}}{-4} = \frac{-3}{4}$

354. (d) Given,

$16a^4 + 36a^2b^2 + 81b^4 = 91$ and

$4a^2 + 9b^2 + 6ab = 13$ .....(i)

Then,

$4a^2 + 9b^2 - 6ab = \frac{91}{13} = 7$ .....(ii)

By subtraction

$12ab = 7 - 13 = -6$

$\Rightarrow 3ab = \frac{-6}{4} = \frac{-3}{2}$

355. (d) $1 + x^2 + x^4 = (1 - x + x^2)(1 + x + x^2)$

$\Rightarrow 585 = 65 \times (1 + x + x^2)$

$\Rightarrow (1 + x + x^2) = 9$

356. (a) We know that,

$x^4 + y^4 + x^2y^2 = (x^2 + y^2 + xy)(x^2 + y^2 - xy)$

$\Rightarrow x^2 + y^2 + xy = \frac{273}{16} \div \frac{21}{4} = \frac{13}{4}$

$x^2 + y^2 = \frac{\left(\frac{21}{4} + \frac{13}{4}\right)}{2} = \frac{17}{4}$

$2xy = \left(-\frac{21}{4} + \frac{13}{4}\right) = -2$

Now,

$(x - y)^2 = \frac{17}{4} + 2 = \frac{25}{4}$

$x - y = \frac{5}{2}$

357. (d) $x^4 + y^4 + x^2y^2 = 21$

$x^2 + y^2 + xy = 7$ ....(i)

$\Rightarrow (x^2 + y^2 + xy)(x^2 + y^2 - xy)$

$= x^4 + y^4 + x^2y^2$

$\Rightarrow x^2 + y^2 - xy = \frac{21}{7} = 3$ ....(ii)

From (i) and (ii)

$x^2 + y^2 = 5$

$\Rightarrow xy = 2$

$\therefore \frac{1}{x^2} + \frac{1}{y^2} = \frac{y^2 + x^2}{x^2y^2} = \frac{5}{4}$

358. (c) Let, $2^x = 3^y = 6^{-z} = k$

$\Rightarrow 2 = k^{\frac{1}{x}}, 3 = k^{\frac{1}{y}}, 6 = k^{\frac{1}{-z}}$

$\therefore 6 = 2 \times 3 = k^{\frac{1}{x}} \times k^{\frac{1}{y}} = k^{\frac{1}{x} + \frac{1}{y}}$

$\Rightarrow k^{-\frac{1}{z}} = k^{\frac{1}{x} + \frac{1}{y}} \Rightarrow -\frac{1}{z} = \frac{1}{x} + \frac{1}{y}$

$\therefore \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

359. (b) $2^{x + y - 2z} = 8^{8z - 5 - y}$

$\Rightarrow 2^{x + y - 2z} = 2^{24z - 15 - 3y}$

By comparing powers

$x + y - 2z = 24z - 15 - 3y$

$\Rightarrow x + 4y - 26z = -15$ ..... (i)

Now,

$5^{4y - 6z} = 25^{y + z}$

$\Rightarrow 5^{4y - 6z} = 5^{2y + 2z}$

By comparing powers

$4y - 6z = 2y + 2z$

$\Rightarrow 2y - 8z = 0 \Rightarrow y - 4z = 0$ ....(ii)

Now,

$3^{4x - 3z} = 9^{x + z} \Rightarrow 3^{4x - 3z} = 3^{2x + 2z}$

By comparing powers

$4x - 3z = 2x + 2z \Rightarrow 2x = 5z$ ....(iii)

By equ. (i), (ii) and (iii)

$x = 5, y = 8, z = 2$

$\therefore 2x + 3y + 5z$

$= 2 \times (5) + 3 \times (8) + 5 \times (2)$

$= 10 + 24 + 10 = 44$

360. (a) $2^2\left(\frac{x^a}{x^b}\right)^{a+b} \times 3^2\left(\frac{x^b}{x^c}\right)^{b+c} \times 6^{-2}\left(\frac{x^c}{x^a}\right)^{a+c}$

$= 4x^{(a^2-b^2)} \times 9(x)^{b^2-c^2} \times \frac{1}{36}(x)^{c^2-a^2}$

$= x^{a^2-b^2+b^2-c^2+c^2-a^2} = x^0 = 1$

361. (c) a + b = 2c

⇒ a + b = c + c ⇒ a – c = c– b

Squaring both sides

$a^2 + c^2 - 2ac = c^2 + b^2 - 2bc$

$\Rightarrow a^2 + 2bc = b^2 + 2ac$

Alternate Method:

a + b = 2c

Put, a = 2, b = 0, c = 1

⇒ 2 + 0 = 2 × 1 ⇒ 2 = 2 (satisfied)

Put the value of a, b, c in option (c)

Now, $a^2 + 2bc = b^2 + 2ac$

$(2)^2 + 0 = 0 + 2 \times 2 \times 1$

4 = 4 (satisfied)

Hence, option (c) is satisfied.

362. (c) x + y + z = 1

$\Rightarrow x = y = z = \frac{1}{3}$

Now, Minimum value of $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$

$= \frac{1}{\frac{1}{3}}+\frac{1}{\frac{1}{3}}+\frac{1}{\frac{1}{3}} = 3 + 3 + 3 = 9$

363. (d) $\left(\frac{3}{a}+3a\right)\left(\frac{9}{a^2}-9+9a^2\right)$

Put a = 1

$\Rightarrow \left(\frac{3}{1}+3\times1\right)\left(\frac{9}{1^2}-9+9\times1\right)$

= 6 × 9 = 54

Alternate Method:

$\left(\frac{3}{a}+3a\right)\left(\frac{9}{a^2}-9+9a^2\right) = \left(\frac{3}{a}\right)^3 + (3a)^3$

Put, a = 1

$\Rightarrow (3)^3 + (3)^3 = 54$

364. (b) Given, $t = \frac{2}{5}$

$\therefore t^3 + \left(\frac{3}{5}\right)^3 + \frac{9}{5}t$

$= \left(\frac{2}{5}\right)^3 + \left(\frac{3}{5}\right)^3 + \frac{9}{5}\times\frac{2}{5}$

$= \frac{8}{125}+\frac{27}{125}+\frac{18}{25} = \frac{8+27+90}{125} = \frac{125}{125} = 1$

Alternate Method:

$t + \frac{3}{5} = \frac{2}{5}+\frac{3}{5} = 1$

$\therefore t^3 + \left(\frac{3}{5}\right)^3 + \frac{9}{5}t(1)$

$= t^3 + \left(\frac{3}{5}\right)^3 + \frac{9}{5}t\left(t+\frac{3}{5}\right) = \left(t+\frac{3}{5}\right)^3$

$= \left(\frac{2}{5}+\frac{3}{5}\right)^3 = 1$

365. (a) $\frac{(25a^2-10ab-48b^2)}{(5a+6b)} \times (5a + 8b)$

$= \frac{25a^2+30ab-40ab-48b^2}{(5a+6b)} \times (5a+8b)$

$= \frac{5a(5a+6b)-8b(5a+6b)}{(5a+6b)} \times (5a+8b)$

$= \frac{(5a-8b)(5a+6b)}{(5a+6b)} \times (5a+8b)$

$= (5a - 8b)(5a + 8b)$

$= 25a^2 - 64b^2$

Alternate Method:

Put a = 0

$\frac{-48b^2}{6b} \times 8b = -64b^2$

Now check that option which option gives us $= -64b^2$

Hence, Option (a) satisfied

366. (a) Given,

a + b = 1

Squaring both sides

$a^2 + b^2 + 2ab = 1$

Divide by a^2b^2 both sides

$\frac{1}{b^2} + \frac{1}{a^2} + \frac{2}{ab} = \frac{1}{a^2b^2}$

367. (d) $(g - h)^2 - (g + h)^2 + 4gh$

$= g^2 + h^2 - 2hg - g^2 - h^2 - 2gh + 4gh$

= – 4gh + 4gh = 0

Alternate Method:

Put, h = 0

$\Rightarrow (g - h)^2 - (g + h)^2 + 4gh = g^2 - g^2 = 0$

368. (d) $\sqrt{a} = 3b$

$\Rightarrow \frac{\sqrt{a}}{b} = \frac{3}{1}$

Squaring both sides

$\frac{a}{b^2} = \frac{9}{1} \Rightarrow \frac{a}{b^2} = 9$

369. (a) $4x^2 - y^2 + 6y - 9$

Go through options, option (a)

$(2x + y - 3)(2x - y + 3)$

$= 4x^2 - 2xy + 6x + 2xy - y^2 + 3y - 6x + 3y - 9 = 4x^2 - y^2 + 6y - 9$

Alternate Method:

$4x^2 - y^2 + 6y - 9$

Put x = 0 and y = 1

⇒ 4 × 0 – 1 + 6 – 9 = – 4

Go through options,

$(2x + y - 3)(2x - y + 3) = (-2)(2) = -4$ (verified)

370. (c) $\frac{3a+b}{2} - \frac{a-3b}{3} + 2b$

$= \frac{9a+3b-2a+6b}{6} + 2b$

$= \frac{7a+9b+12b}{6} = \frac{7a+21b}{6}$

$= \frac{7(a+3b)}{6}$

Alternate Method:

Put a = b = 1

$\frac{3a+b}{2} - \frac{a-3b}{3} + 2b = \frac{4}{2} - \frac{(-2)}{3} + 2$

$= 2 + \frac{2}{3} + 2 = \frac{14}{3}$

Go through options (c)

$\frac{7(a+3b)}{6} = \frac{7(1+3)}{6} = \frac{14}{3}$

371. (a) ab – a – b + 1

= a(b – 1) –1 (b – 1)

= (a – 1)(b – 1)

Alternate Method:

Put a = 0 and b = 0

(a – 1) (b – 1) = ab – a – b + 1

⇒ (0 – 1) (0 – 1) = 0 – 0 – 0 + 1

⇒ (– 1) × (– 1) = 1

⇒ 1 = 1

Option (a) is correct.

372. (b) $4(z + 7)(2z - 1) = Az^2 + Bz + C$

Put z = 1

⇒ 4(8) (2 –1) = A + B + C

⇒ 32 = A + B + C

373. (a) I. x + y + z = 12 – 2 – 10 = 0

$\Rightarrow x^3 + y^3 + z^3 = 3xyz$

= 3 × 12 × (–2) (–10) = 720

Statement I is not true

II. $4(x^2 + y^2) = 4[(x + y)^2 - 2xy]$

$= 4[(48)^2 - 64] = 8960$

Statement II is also not true

Both statements are false

374. (d) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$\therefore x^3 + (3y)^3 + (4z)^3 - 3 \times x \times 3y \times 4z$

$= (x + 3y + 4z)(x^2 + 9y^2 + 16z^2 - 3xy - 12yz - 4xz)$

375. (b) $x^2 + 4y^2 + 3z^2 + \frac{19}{4} = 2\sqrt{3}(x + y + z)$

$x^2 + 4y^2 + 3z^2 + \frac{19}{4} = 2(\sqrt{3}x + \sqrt{3}y + \sqrt{3}z)$

Coefficient ⇒ $x = \frac{\sqrt{3}}{1} = \sqrt{3}$

$y = \frac{\sqrt{3}}{4}, z = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$

$\therefore (x - 4y + 3z)$

$= \left(\sqrt{3} - 4\times\frac{\sqrt{3}}{4} + 3\times\frac{1}{\sqrt{3}}\right)$

$= (\sqrt{3} - \sqrt{3} + \sqrt{3}) = \sqrt{3}$

376. (c) A.T.Q.

$\sqrt{\frac{a}{b}} - \sqrt{\frac{b}{a}} = \frac{8}{3}$

If $x - \frac{1}{x} = k$, Then $x^2 + \frac{1}{x^2} = k^2 + 2$

$\Rightarrow \frac{a}{b} + \frac{b}{a} = \frac{64}{9} + 2 \Rightarrow \frac{a^2+b^2}{ab} = \frac{82}{9}$

$\because (a + b) = 30$

$\Rightarrow (a + b)^2 = 900 \Rightarrow a^2 + b^2 + 2ab = 900$

$\Rightarrow \frac{82}{9}ab + 2ab = 900 \Rightarrow \frac{100}{9}ab = 900$

⇒ ab = 81

Alternate Method:

$\sqrt{\frac{a}{b}} = \frac{8}{3} + \sqrt{\frac{b}{a}}$, a + b = 30

Put a = 27, b = 3

∴ ab = 27 × 3 = 81

377. (a) $\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = \frac{8}{3}$

$\Rightarrow m\frac{a}{b} + \frac{b}{a} = \frac{64}{9} - 2 \Rightarrow \frac{a^2+b^2}{ab} = \frac{46}{9}$

Now, (a – b) = 10

Squaring both side

$\Rightarrow a^2 + b^2 - 2ab = 100$

$\Rightarrow \frac{46}{9}ab - 2ab = 100$

$\Rightarrow 28ab = 900 \Rightarrow ab = \frac{225}{7} = 32\frac{1}{7}$

378. (a) $\frac{1}{8}\left[\frac{1}{(b-1)} - \frac{1}{(b+1)} - \frac{2}{(b^2+1)} - \frac{4}{b^4+1}\right]$

$= \frac{1}{8}\left[\frac{b+1-b+1}{b^2-1} - \frac{2}{b^2+1} - \frac{4}{b^4+1}\right]$

$= \frac{1}{8}\left[2\left(\frac{b^2+1-b^2+1}{b^4-1}\right) - \frac{4}{b^4+1}\right]$

$= \frac{1}{8}\left[\frac{4}{b^4-1} - \frac{4}{b^4+1}\right] = \left(\frac{1}{b^8-1}\right)$

Alternate Method:

$$\frac{1}{8}\left[\frac{1}{b-1}-\frac{1}{b+1}-\frac{2}{b^2+1}-\frac{4}{b^4+1}\right]$$

Put b = 0,

$$\Rightarrow \frac{1}{8}\,[-1-1-2-4]$$

$$= \frac{1}{8}\times(-8) = -1$$

Go through options,

$$\frac{1}{b^8-1} = -1$$

379. (b) $ax + by = 1$ .....(i)

$$bx + ay = \frac{2ab}{a^2+b^2} \qquad \text{....(ii)}$$

Divide (i) by (ii), $\frac{ax+by}{bx+ay} = \frac{a^2+b^2}{2ab}$

$\Rightarrow 2a^2xb + 2ab^2y = a^2bx + b^3x + a^3y + ab^2y$

$\Rightarrow a^2xb + ab^2y = b^3x + a^3y$

$\Rightarrow a^2bx - b^3x = a^3y - ab^2y$

$\Rightarrow x(a^2b - b^3) = y(a^3 - ab^2)$

$$\Rightarrow \frac{x}{y} = \frac{a^3-ab^2}{a^2b-b^3} \Rightarrow \frac{x}{y} = \frac{a(a^2-b^2)}{b(a^2-b^2)}$$

$$\Rightarrow \frac{x}{y} = \frac{a}{b} \Rightarrow y = \frac{xb}{a} \qquad \text{...(iii)}$$

Put value of x and y from equation (iii) in equation (i)

$$ax + b\times\frac{xb}{a} = 1 \Rightarrow ax + \frac{b^2x}{a} = 1$$

$$\Rightarrow a^2x + b^2x = a \Rightarrow x = \frac{a}{a^2+b^2}$$

Alternate Method:

$ax + by = 1$ .....(i)

$$bx + ay = \frac{2ab}{a^2+b^2} \qquad \text{....(ii)}$$

(ii) × b − (i) × a

$$\Rightarrow x(b^2-a^2) = \frac{2ab^2}{a^2+b^2} - a$$

$$\Rightarrow x = \frac{2ab^2-a^3-ab^2}{(a^2+b^2)(b^2-a^2)}$$

$$= \frac{a(b^2-a^2)}{(a^2+b^2)(b^2-a^2)} = \frac{a}{a^2+b^2}$$

380. (a) $\frac{2a-5}{a} - \frac{4b-5}{b} + \frac{6c+5}{c} = 0$

$$\Rightarrow 2 - \frac{5}{a} - 4 + \frac{5}{b} + 6 + \frac{5}{c} = 0$$

$$\Rightarrow (2-4+6) - \frac{5}{a} + \frac{5}{b} + \frac{5}{c} = 0$$

$$\Rightarrow \frac{-1}{a} + \frac{1}{b} + \frac{1}{c} = -\frac{4}{5}$$

$$\Rightarrow \frac{1}{a} - \frac{1}{b} - \frac{1}{c} = \frac{4}{5}$$

381. (b) $\frac{2x}{x+2} + \frac{1}{2x+4} - \frac{12-x}{2x^2+4x} = a + \frac{b}{x}$

$$\Rightarrow \frac{2x}{x+2} + \frac{1}{2(x+2)} - \frac{12-x}{2x(x+2)} = a + \frac{b}{x}$$

$$\Rightarrow \frac{4x^2+x-12+x}{2x(x+2)} = \frac{ax+b}{x}$$

$$\Rightarrow \frac{4x^2+2x-12}{2x(x+2)} = \frac{ax+b}{x}$$

$$\Rightarrow \frac{2x^2+x-6}{x+2} = ax + b$$

$\Rightarrow 2x^2 + x - 6 = ax^2 + bx + 2ax + 2b$

coefficient of $2x^2 = ax^2 \Rightarrow a = 2$

$-6 = 2b \Rightarrow b = -3$

$\therefore ab = 2 \times (-3) = -6$

382. (d) $mx^m - nx^n = 0 \Rightarrow x^m = \frac{nx^n}{m}$

$$\therefore \frac{1}{x^m+x^n} + \frac{1}{x^m-x^n}$$

$$= \frac{1}{\frac{n}{m}x^n + x^n} + \frac{1}{\frac{n}{m}x^n - x^n}$$

$$= \frac{m}{nx^n+mx^n} + \frac{m}{nx^n-mx^n}$$

$$= \frac{m}{x^n(n+m)} + \frac{m}{x^n(n-m)}$$

$$= \frac{m(n-m)+m(n+m)}{x^n(n^2-m^2)} = \frac{2mn}{x^n(n^2-m^2)}$$

Alternate Method:

$mx^m - nx^n = 0$

$$\Rightarrow mx^m = nx^n \Rightarrow \frac{m}{n} = \frac{x^n}{x^m}$$

Given equ. → $\frac{1}{n+m} + \frac{1}{n-m} = \frac{2n}{n^2-m^2}$

$$= \frac{2mn}{m(n^2-m^2)} = \frac{2mn}{x^n(n^2-m^2)}$$

383. (a) $y = 1 + \sqrt{3} + \sqrt{4} = 1 + \sqrt{3} + 2$

$= 3 + \sqrt{3} \Rightarrow y - 3 = \sqrt{3}$

Squaring both sides

$y^2 + 9 - 6y = 3$

$\Rightarrow y^2 = 6y - 6$ ......(i)

$\Rightarrow y^3 = y \times y^2 = 6\,(y^2 - y)$ .....(ii)

Squaring (i) both sides again:-

$\Rightarrow y^4 = 36\,[y^2 + 1 - 2y]$ .....(iii)

Putting (i), (ii) and (iii) in given equation

$\Rightarrow 2y^4 - 8y^3 - 6y^2 + 28y - 84$

$= 72y^2+72-144y-48y^2+48y-6y^2+28y-84$

$= 18y^2 - 68y - 12$

$= 108y - 108 - 68y - 12$

$= 40y - 120 = 40[y - 3]$

$= 40\left[3+\sqrt{3}-3\right] = 40\sqrt{3}$

384. (d) $\frac{r}{13} + \frac{13}{r} = 1$ Let, $x = \frac{r}{13}$

If $x + \frac{1}{x} = 1 \Rightarrow x^3 = -1$

$$\Rightarrow \left(\frac{r}{13}\right)^3 = -1 \Rightarrow r^3 = -2197$$

385. (d) $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$

$$\Rightarrow (x-2)^3 = \left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)^3$$

$\Rightarrow x^3 - 8 - 3x \times 2\,(x - 2)$

$$= 2^2 - 2 - 3\times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}}\left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)$$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 2 - 3 \times 2\,(x - 2)$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 2 - 6x + 12$

$\Rightarrow x^3 - 6x^2 + 18x = 22$

SMART APPROACH:-

$$x = \underset{\substack{\downarrow\\ a}}{2} - \underset{\substack{\downarrow\\ b}}{2^{\frac{1}{3}}} + \underset{\substack{\downarrow\\ c}}{2^{\frac{2}{3}}}$$

$\therefore x^3 - 6x^2 + 18x = a^3 - b^3 + c^3 + 3abc = 8 - 2 + 4 + 12 = 22$

386. (c) $\frac{\left\{(m^2+n^2)(m-n)-(m-n)^3\right\}}{(m^2n-mn^2)}$

$$= \frac{(m-n)\left\{(m^2+n^2)-(m-n)^2\right\}}{mn(m-n)}$$

$$= \frac{m^2+n^2-(m^2+n^2-2mn)}{mn}$$

$$= \frac{2mn}{mn} = 2$$

387. (a) $x = \sqrt{1+\frac{\sqrt{3}}{2}} - \sqrt{1-\frac{\sqrt{3}}{2}}$

Square both side

$$x^2 = 1 + \frac{\sqrt{3}}{2} + 1 - \frac{\sqrt{3}}{2} - 2\sqrt{\left(1-\frac{\sqrt{3}}{2}\right)\left(1+\frac{\sqrt{3}}{2}\right)}$$

$$\Rightarrow x^2 = 2 - 2\sqrt{1-\frac{3}{4}}$$

$$\Rightarrow x^2 = 2 - 2 \times \frac{1}{2}$$

$\Rightarrow x^2 = 1 \Rightarrow x = 1$

$$\therefore \frac{\sqrt{2}-x}{\sqrt{2}+x} \times \frac{\sqrt{2}-x}{\sqrt{2}-x} = (\sqrt{2}-x)^2$$

$= 2 + 1 - 2\sqrt{2}$

$= 3 - 2.82 \sim 0.17$

388. (d) $x = \sqrt{1+\frac{\sqrt{3}}{2}} - \sqrt{1-\frac{\sqrt{3}}{2}}$

$$= \sqrt{\frac{2+\sqrt{3}}{2}} - \sqrt{\frac{2-\sqrt{3}}{2}}$$

Multiply by $\sqrt{2}$ in numerator and denominator

$$\sqrt{\frac{4+2\sqrt{3}}{4}} - \sqrt{\frac{4-2\sqrt{3}}{4}}$$

$$= \frac{\sqrt{3}+1}{2} - \frac{\sqrt{3}-1}{2}$$

$$x = \frac{\sqrt{3}+1-\sqrt{3}+1}{2} = 1$$

$$\therefore \frac{\sqrt{3}-x}{\sqrt{3}+x} = \frac{\sqrt{3}-1}{\sqrt{3}+1} = \frac{1.732-1}{1.732+1}$$

$$= \frac{0.732}{2.732} = 0.27$$

389. (a) $x^2 + y^2 = 280$, $xy = 120$

$(x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow (x + y)^2 = 280 + 240$

$\Rightarrow x + y = \sqrt{520} = 2\sqrt{13} \times \sqrt{10}$

$(x - y)^2 = x^2 + y^2 - 2xy$

$\Rightarrow (x - y)^2 = 280 - 240$

$\Rightarrow x - y = \sqrt{40} = 2\sqrt{10}$

$$\therefore \frac{x-y}{x+y} = \frac{2\sqrt{10}}{2\sqrt{13}\times\sqrt{10}} = \frac{1}{\sqrt{13}}$$

390. (a) $m + n = 24$
Put,
$n = 0$, then $m = 24$
Now,
$(m - 16)^3 + (n - 8)^3$
$= (24 - 16)^3 + (0 - 8)^3$
$= 8^3 + (-8)^3 = 0$

Alternate Method:
Since, $(m - 16)^3 + (n - 8)^3 = ?$
Let, $m = 16, n = 8$
$\Rightarrow m + n = 24$
$\Rightarrow (16 - 16)^3 + (8 - 8)^3 = 0$

391. (a) $3x + 2y = 10$
$\Rightarrow 9x^2 + 4y^2 + 42 = 100$
$\Rightarrow 9x^2 + 4y^2 = 58$
Now,
$\Rightarrow 9x^2 + 4y^2 - 12xy = 58 - 12xy$
$\Rightarrow (3x - 2y)^2 = 58 - 42 = 16$
$\Rightarrow 3x - 2y = 4$

392. (c) $\because \sqrt{1+\frac{x^3}{9}} = 5$
Square both sides,
$\Rightarrow 1+\frac{x^3}{9} = 25 \Rightarrow \frac{x^3}{9} = 24$
$\Rightarrow x^3 = 216 \Rightarrow x = 6$

393. (a) $\frac{A}{L}+\frac{M}{B}=1$
Let, $\frac{A}{L}=x$, $\frac{M}{B}=y$ and $\frac{C}{N}=z$
ATQ, $\frac{A}{L}+\frac{M}{B}=1$
$\Rightarrow x + y = 1 \Rightarrow x = 1 - y$
$\Rightarrow \frac{1}{x}=\frac{1}{1-y}$ .....(i)
Again,
$\frac{B}{M}+\frac{N}{C} = 1$
$\Rightarrow \frac{1}{y}+\frac{1}{z} = 1 \Rightarrow \frac{1}{z}=1-\frac{1}{y}=\frac{y-1}{y}$
$\Rightarrow z = \frac{y}{y-1}$ .....(ii)
Put the value from equation (i) and (ii)
$\frac{L}{A}+\frac{C}{N} = \frac{1}{x}+z=\frac{1}{1-y}+\frac{y}{y-1}$
$= \frac{1-y}{1-y} = 1$

SMART APPROACH:-
Let, $\frac{A}{L}=x, \frac{B}{M}=y, \frac{C}{N}=z$
Then, $x+\frac{1}{y}=1, y+\frac{1}{z}=1$
There is two equation and 3 variables so we can use value putting,
Let $x=\frac{1}{2}, y=2$ then $z=-1$
$\frac{L}{A}+\frac{C}{N}=\frac{1}{x}+z=2-1=1$

394. (d) $xy = 6$ & $x^2y + xy^2 + x + y = 63$
$\Rightarrow (xy + 1)(x + y) = 63$
$\Rightarrow 7(x + y) = 63 \Rightarrow x + y = 9$
$\therefore x^2 + y^2 = (x + y)^2 - 2xy$
$= 81 - 12 = 69$

395. (c) $x^2 = b - ax \Rightarrow x = \frac{b}{x} - a$
$\Rightarrow x-\frac{b}{x} = -a$
Cubing both sides
$\left(x-\frac{b}{x}\right)^3 = (-a)^3$
$\Rightarrow x^3 - \frac{b^3}{x^3} - 3 \times x \times \frac{b}{x}\left(x-\frac{b}{x}\right) = -a^3$
$\Rightarrow x^3 - \frac{b^3}{x^3} = -a^3 - 3ba$
$\Rightarrow x^3 - \frac{b^3}{x^3} = -(a^3 + 3ba)$
$\Rightarrow x^3 + a^3 + 3ba = \frac{b^3}{x^3}$
$\Rightarrow x^3\{x^3 + (a^3 + 3ba)\} = b^3$
Compare it with $x^3(x^3 + c) = d$
$c = a^3 + 3ba$
$d = b^3$

Alternate Method:
$x^2 = b - ax$ .....(i)
$x^3(x^3 + c) = d$ .....(ii)
Let $x = 1$, $a = 1$
Equation (i)
$\Rightarrow 1 = b - 1$
$\Rightarrow b = 2$
$\therefore$ Equation (ii)
$\Rightarrow 1(1 + c) = d \Rightarrow d - c = 1$
Now, in option (c),
$c = 1^3 + 3 \times 2 \times 1 = 7$
$d = 2^3 = 8$
$d - c = 8 - 7 = 1$
$\therefore$ Option (c) is correct.

396. (a) $3x(3x - 8) + y(y + 1) + 4z^2 - 2z + 16\frac{1}{2} = 0$
$\Rightarrow 9x^2-24x+y^2+y+4z^2-2z+16\frac{1}{2}=0$
$\Rightarrow (3x-4)^2+\left(y+\frac{1}{2}\right)^2+\left(2z-\frac{1}{2}\right)^2=0$
$x=\frac{4}{3}, y=-\frac{1}{2}, 2z=\frac{1}{2}$
$\therefore 6x+y+2z=6\times\frac{4}{3}-\frac{1}{2}+\frac{1}{2}=8$

Alternate Method:
$3x(3x - 8) + y(y + 1) + 4z^2 - 2z + 16\frac{1}{2} = 0$
$\Rightarrow 9x^2-24x+y^2+y+4z^2-2z+16\frac{1}{2}=0$
$\Rightarrow 9x^2+y^2+4z^2=24x-y+2z-16\frac{1}{2}$
$\Rightarrow 9x^2+y^2+4z^2=2(12x-\frac{y}{2}+z)-16\frac{1}{2}$
$x=\frac{12}{9}=\frac{4}{3}, y=\frac{-1}{2}, z=\frac{1}{4}$
$\therefore 6x+y+2z=6\times\frac{4}{3}-\frac{1}{2}+2\times\frac{1}{4}=8$

397. (c) ATQ,
$D = b^2 - 4ac$
$= 4k^2 - 4 \times 3 \times 3 = 4k^2 - 36$
For real and equal roots, $D = 0$
$4k^2 - 36 = 0$
$\Rightarrow 4k^2 = 36 \Rightarrow k = 3$

398. (b) We know, for no solution–
$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$
$18x + 36y + 45 = 0$
$px - 54y + 67 = 0$
$\Rightarrow \frac{18}{p}=\frac{36}{-54} \Rightarrow p = -27$

399. (a) $k(21x^2 + 24) + rx + (14x^2 - 9) = 0$
$\Rightarrow 21kx^2 + 24k + rx + 14x^2 - 9 = 0$
$\Rightarrow (21k + 14)x^2 + rx + 24k - 9 = 0$ .....(i)
$k(7x^2 + 8) + px + (2x^2 - 3) = 0$
$\Rightarrow 7kx^2 + 8k + px + 2x^2 - 3 = 0$
$\Rightarrow (7k + 2)x^2 + px + 8k - 3 = 0$ ....(ii)
On dividing (i) by (ii), we get–
$\frac{21k+14}{7k+2}=\frac{r}{p}=\frac{24k-9}{8k-3}$
$\Rightarrow \frac{r}{p}=\frac{3(8k-3)}{8k-3} \Rightarrow \frac{r}{p}=3 \Rightarrow \frac{p}{r}=\frac{1}{3}$

400. (b) $6x^2 + 13x + 7 = 0$
$\alpha+\beta=\frac{-13}{6}, \alpha\beta=\frac{7}{6}$
$\therefore \alpha^2 + \beta^2 = [\alpha + \beta]^2 - 2\alpha\beta$
$=\frac{169}{36}-\frac{7}{3}=\frac{169-84}{36}=\frac{85}{36}$
$\alpha^2\beta^2=\frac{49}{36}$
$\Rightarrow x^2 - (\alpha^2 + \beta^2)x + \alpha^2\beta^2 = 0$ is the required equation
$\Rightarrow x^2-\frac{85}{36}x+\frac{49}{36}=0$
$\Rightarrow 36x^2 - 85x + 49 = 0$

401. (c) Given, $x - y + z = 2a$ .....(i)
$x + 4y - 2z = 3(4 - a)$ ....(ii)
$2x - 3y + 4z = 6 - 2a$ ....(iii)
$\because x, y, z$ are consecutive number
$x + z = 2y$
In equation (i)
$x - y + z = 2a$
$\Rightarrow 2y - y = 2a$
$\Rightarrow y = 2a$ ....(iv)
In equation (ii)
$\Rightarrow x + 4y - 2z = 12 - 3a$
$\Rightarrow x + 2x + 2z - 2z = 12 - 3a$
$\Rightarrow 3x = 12 - 3a$
$\Rightarrow x = 4 - a$ ....(v)
From eqn. (iv) and (v)
$4 - 3a = 1$
$\Rightarrow 3a = 3$
$\Rightarrow a = 1$

22 Chapter

TRIGONOMETRY

◆ TYPE – I ◆

BASIC TRIGONOMETRIC RATIOS

1. If $\tan A = \frac{4}{3}, 0 \le A \le 90°$, then find the value of sin A.

SSC CPO 03/10/2023 (Shift-01)

(a) $\frac{3}{5}$ (b) $\frac{7}{5}$

(c) $\frac{4}{5}$ (d) $\frac{4}{7}$

2. If $\tan(t) = \frac{3}{7}$, t is an acute angle, then what is the value of cosec(t)?

SSC CHSL 08/07/2024 (Shift-02)

(a) $\frac{\sqrt{53}}{3}$ (b) $\frac{\sqrt{58}}{7}$

(c) $\frac{\sqrt{53}}{7}$ (d) $\frac{\sqrt{58}}{3}$

3. If θ is an acute angle and $\cos\theta = \frac{11}{17}$, what is the value of tan θ?

SSC CHSL 08/08/2023 (Shift-02)

(a) $\frac{4\sqrt{10}}{11}$ (b) $\frac{13}{11}$

(c) $\frac{2\sqrt{42}}{11}$ (d) $\frac{2\sqrt{42}}{17}$

4. If θ is an acute angle and $\sin\theta = \frac{13}{19}$, what is the value of cos θ?

SSC CHSL 08/08/2023 (Shift-03)

(a) $\frac{6}{19}$ (b) $\frac{10\sqrt{2}}{19}$

(c) $\frac{14}{19}$ (d) $\frac{8\sqrt{3}}{19}$

5. If $\tan(A) = \frac{3}{5}$, then cos(A) is equal to:

SSC CGL 17/09/2024 (Shift-03)

(a) $\frac{5}{\sqrt{34}}$ (b) $\frac{9}{\sqrt{34}}$

(c) $\frac{3}{\sqrt{34}}$ (d) $\frac{25}{\sqrt{34}}$

6. If θ is an acute angle and $\sin\theta = \frac{21}{25}$, then what is the value of tanθ?

SSC CHSL 11/08/2023 (Shift-04)

(a) $\frac{2\sqrt{46}}{21}$ (b) $\frac{25}{2\sqrt{46}}$

(c) $\frac{21}{2\sqrt{46}}$ (d) $\frac{2\sqrt{46}}{25}$

7. If θ is an acute angle and $\sin\theta = \frac{43}{47}$, what is the value of cotθ?

SSC CHSL 14/08/2023 (Shift-03)

(a) $\frac{6\sqrt{10}}{47}$ (b) $\frac{43}{6\sqrt{10}}$

(c) $\frac{47}{6\sqrt{10}}$ (d) $\frac{6\sqrt{10}}{43}$

8. In a right triangle for an acute angle x, find sin$x$. It is given that tan$x$ = 5.

SSC CPO 09/11/2022 (Shift-02)

(a) $\frac{1}{3}$ (b) $\frac{5}{\sqrt{26}}$

(c) $\frac{2}{5}$ (d) $\frac{5}{\sqrt{28}}$

9. If $\sec(t) = \frac{x}{y}$, then cot(t) is equal to:

SSC CGL 18/09/2024 (Shift-01)

(a) $\frac{y}{\sqrt{x^2-y^2}}$ (b) $\frac{x}{\sqrt{x^2+y^2}}$

(c) $\frac{x}{\sqrt{x^2+y^2}}$ (d) $\frac{y}{\sqrt{x^2+y^2}}$

10. If θ be acute angle and $\cos\theta = \frac{24}{25}$, then the value of cot(90 – θ) is equal to:

SSC CHSL 05/07/2024 (Shift-03)

(a) $\frac{6}{25}$ (b) $\frac{7}{24}$

(c) $\frac{7}{25}$ (d) $\frac{5}{24}$

11. If $\cos A = \frac{15}{17}, 0 \le A \le 90°$, then the value of cot (90° – A) is:

SSC CPO 03/10/2023 (Shift-02)

(a) $\frac{8}{15}$ (b) $\frac{7}{15}$

(c) $\frac{\sqrt{2}}{15}$ (d) $\frac{2\sqrt{2}}{15}$

12. What is the value of sec(t), if tan(t) = $\frac{1}{3}$?

SSC CGL 09/09/2024 (Shift-02)

(a) $\frac{2\sqrt{2}}{3}$ (b) $\frac{\sqrt{10}}{9}$

(c) $\frac{\sqrt{10}}{3}$ (d) $\frac{\sqrt{3}}{3}$

13. If $\sin\theta = \frac{7}{25}$, then cosθ and tanθ are respectively ________.
(where θ is in the first quadrant)

SSC CHSL 09/07/2024 (Shift-03)

(a) $\frac{25}{24}$ and $\frac{24}{7}$ (b) $\frac{25}{7}$ and $\frac{7}{24}$

(c) $\frac{24}{25}$ and $\frac{24}{7}$ (d) $\frac{24}{25}$ and $\frac{7}{24}$

14. If $\tan A = \frac{1}{\sqrt{10}}$, A is an acute angle, then the value of sinA + cosecA is

SSC CGL 23/09/2024 (Shift-0

(a) $\frac{11}{\sqrt{10}}$ (b) $\frac{1}{\sqrt{10}}$

(c) $\frac{12}{\sqrt{11}}$ (d) $\frac{10}{\sqrt{11}}$

15. If $\sin A = \frac{2}{3}$, then find the value of (7 – tanA) (3 + cosA).

SSC CPO 05/10/2023 (Shift-0

(a) $\frac{61}{3} + \frac{17}{\sqrt{5}}$ (b) $\frac{61}{3} - \frac{17}{3\sqrt{5}}$

(c) $\frac{61}{3} + \frac{17}{3\sqrt{5}}$ (d) $\frac{61}{3\sqrt{5}} + \frac{17}{3}$

16. If $\sin\beta = \frac{1}{3}$, $(\sec\beta - \tan\beta)^2$ is equal to

SSC CPO 05/10/2023 (Shift-0

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

17. If $\cos A = \frac{63}{65}$, then find the value of tan A + cot A (up to two places of decimal).

SSC CHSL 02/08/2023 (Shift-0

(a) 4.19 (b) 2.76

(c) 3.19 (d) 5.23

18. If $\sin \alpha = \frac{5}{13}$, then the value of cosα.cosecα.cotα is ________ ?

SSC CPO 27/06/2024 (Shift-0

(a) $\frac{12}{5}$ (b) $\frac{144}{25}$

(c) $\frac{5}{12}$ (d) $\frac{25}{144}$

19. If $\tan\theta = \frac{7}{24}$, then find the value of $(\cos^2\theta - \sin^2\theta)$.

SSC CPO 27/06/2024 (Shift-0

(a) $\frac{576}{550}$ (b) $\frac{576}{550}$

(c) $\frac{527}{625}$ (d) $\frac{520}{625}$

20. If $\cot\theta = \frac{4}{3}, 0 < \theta < \frac{\pi}{2}$ and $5p\cos^2\theta\sin\theta = \cot^2\theta$, then the value of p is:

SSC CPO 03/10/2023 (Shift-02)

(a) $\frac{7}{27}$ (b) $\frac{5}{27}$

(c) $\frac{25}{27}$ (d) $\frac{125}{27}$

21. If $\sin\theta = \frac{5}{6}$, the value of $\cot\theta \cdot \sin\theta \cdot \cos\theta$ is ....

SSC CHSL 08/08/2023 (Shift-03)

(a) $\frac{6}{5}$ (b) $\frac{25}{36}$

(c) $\frac{5}{6}$ (d) $\frac{11}{36}$

22. If $\sin\theta = \frac{4}{5}$, find the value of $\tan\theta - \cot\theta$.

SSC CGL 17/07/2023 (Shift-02)

(a) $\frac{5}{12}$ (b) $\frac{7}{9}$

(c) $\frac{7}{12}$ (d) $\frac{7}{8}$

23. If $\cot B = \frac{15}{8}$, where B is an acute angle, what is the value of sec B + tan B?

SSC CHSL 03/08/2023 (Shift-02)

(a) $\frac{4}{5}$ (b) $\frac{5}{3}$

(c) $\frac{5}{4}$ (d) $\frac{3}{5}$

24. If $\sin A = \frac{8}{17}$ then what is the value cot A + sec A?

SSC CHSL TIER-II 26/06/2023

(a) $4\frac{1}{120}$ (b) $2\frac{1}{120}$

(c) $5\frac{1}{120}$ (d) $3\frac{1}{120}$

25. If 4cotA = 5, then what is the value of 6 secA tanA?

SSC CHSL 10/03/2023 (Shift-01)

(a) $\frac{20\sqrt{41}}{21}$ (b) $\frac{25\sqrt{41}}{24}$

(c) $\frac{24\sqrt{41}}{25}$ (d) $\frac{3}{2}\sqrt{41}$

26. If $\cot\theta = \frac{28}{45}$, then find the value of $(\sin\theta - \cos\theta)$.

SSC CPO 27/06/2024 (Shift-01)

(a) $\frac{45}{28}$ (b) $\frac{7}{53}$

(c) $\frac{28}{53}$ (d) $\frac{17}{53}$

27. If 3 tanA = 4 and A is an acute angle, then the value of 4sinA + 3 cosA is:

SSC CGL 24/09/2024 (Shift-02)

(a) 1 (b) 3

(c) 4 (d) 5

28. If $\cos A = \frac{4}{5}$, then find the value of (8 + sinA) (3 – tanA).

SSC CPO 29/06/2024 (Shift-03)

(a) $\frac{373}{20}$ (b) $\frac{367}{20}$

(c) $\frac{387}{20}$ (d) $\frac{381}{20}$

29. If $\sec\theta = \frac{29}{20}$ where $0 < \theta < 90°$ then what is the value of $3\operatorname{cosec}\theta + 3\cot\theta$?

SSC CGL 17/09/2024 (Shift-01)

(a) $\frac{7}{3}$ (b) 7

(c) 14 (d) 49

30. If 4 tan A = 3, then $\cos^2A - \sin^2A$ equals:

SSC Phase-XI 27/06/2023 (Shift-03)

(a) $\frac{1}{5}$ (b) $\frac{7}{25}$

(c) $\frac{9}{25}$ (d) $\frac{3}{5}$

31. If $\sin B = \frac{15}{17}$, What is the value of cosB(secB – tanB)? Given that $0 < B < \frac{\pi}{2}$

SSC CGL 13/09/2024 (Shift-02)

(a) $\frac{1}{16}$ (b) $\frac{2}{15}$

(c) $\frac{8}{15}$ (d) $\frac{2}{17}$

32. If $\tan A = \sqrt{2} - 1$ then find the value of sinA cosA + tanA.

SSC CHSL 10/07/2024 (Shift-01)

(a) $\frac{24\sqrt{2}+15}{4}$ (b) $\frac{5\sqrt{2}-4}{4}$

(c) $\frac{24\sqrt{2}-15}{4}$ (d) $\frac{5\sqrt{2}+4}{4}$

33. If $\sqrt{3}\tan\theta = 3\sin\theta$, then what is the value of $\sin^2\theta - \cos^2\theta$?

SSC CGL TIER-II 08/08/2022

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$

(c) $\frac{1}{3}$ (d) $\frac{1}{4}$

34. If $\sin A = \frac{5}{13}$ and 7 cot B = 24, then the value of (secA cosB)(cosecBtan A) is:

SSC CGL TIER-II 29/01/2022

(a) $\frac{13}{7}$ (b) $\frac{65}{42}$

(c) $\frac{15}{13}$ (d) $\frac{13}{14}$

35. If $\operatorname{cosec}\theta = \frac{5}{3}$, then evaluate $(\sec^2\theta - 1) \times \cot^2\theta \times (1 + \cot^2\theta)$.

SSC CGL 09/09/2024 (Shift-01)

(a) $\frac{25}{16}$ (b) $\frac{9}{16}$

(c) $\frac{25}{9}$ (d) $\frac{4}{5}$

36. If $\sin A = \frac{5}{13}$, then find the value of $\frac{\cos A - 2\tan A}{\sin A + 3\tan A}$.

SSC CGL TIER-II (20/01/2025)

(a) $\frac{11}{255}$ (b) $\frac{12}{255}$

(c) $\frac{14}{255}$ (d) $\frac{13}{255}$

37. If $\cot\theta = \frac{3}{4}$, θ is an acute angle, then $\sin\theta + \cos\theta - \tan\theta$ is equal to:

SSC CHSL 04/07/2024 (Shift-04)

(a) $\frac{1}{11}$ (b) $\frac{1}{13}$

(c) $\frac{1}{18}$ (d) $\frac{1}{15}$

38. If cot A = 7, then the value of $\frac{5\cos A + 4\sin A}{\cos^3 A + 7\sin^3 A + 6\sin A}$ is:

SSC CHSL 01/07/2024 (Shift-03)

(a) 3 (b) 2

(c) 0 (d) 1

39. If $\cot A = \frac{5}{12}$, then find the value of $\frac{\sqrt{\sec A - \operatorname{cosec} A}}{\sqrt{\sec A + \operatorname{cosec} A}} - \sqrt{\frac{17}{7}}$.

SSC CHSL 08/07/2024 (Shift-01)

(a) $\frac{24}{\sqrt{119}}$ (b) 0

(c) $-\frac{10}{\sqrt{119}}$ (d) $\frac{10}{\sqrt{119}}$

40. If $8\cot\theta = 7$, then the value of $\frac{1+\sin\theta}{\cos\theta}$ is:

SSC CGL 26/09/2024 (Shift-02)

(a) $\frac{8+\sqrt{113}}{7}$ (b) $\frac{1+\sqrt{113}}{8}$

(c) $\frac{7+\sqrt{113}}{8}$ (d) $\frac{1+\sqrt{113}}{7}$

41. If $\sqrt{13}\sin\theta = 2$, then the value of $\frac{3\tan\theta + \sqrt{13}\sin\theta}{\sqrt{13}\cos\theta - 3\tan\theta}$ is:

SSC CHSL 02/07/2024 (Shift-04)

(a) 4 (b) 3

(c) 2 (d) 0

42. Given that $\sin\theta = \frac{15}{17}$. Evaluate $\frac{15\cot\theta + 17\sin\theta}{8\tan\theta + 16\sec\theta}$, where $0° < \theta < 90°$.

SSC CHSL 02/07/2024 (Shift-02)

(a) $\frac{23}{49}$ (b) $\frac{49}{26}$
(c) $\frac{49}{23}$ (d) $\frac{26}{23}$

43. If $\tan\theta = \frac{7}{4}$, then the value of $\frac{4\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta}$ is equal to:

SSC CHSL 09/07/2024 (Shift-02)

(a) $\frac{2}{5}$ (b) $\frac{1}{3}$
(c) $\frac{4}{5}$ (d) $\frac{3}{5}$

44. If $\tan x = \frac{7}{5}$, then the value of $\frac{9\sin x - \frac{42}{5}\cos x}{15\sin x + 21\cos x}$ is

SSC CGL 24/07/2023 (Shift-03)

(a) 0 (b) 1
(c) 0.1 (d) 0.5

45. If $3\cot A = \frac{7}{3}$, what is the value of given expression $\frac{3\cos A + 2\sin A}{3\cos A - 2\sin A} = ?$

SSC CGL 27/07/2023 (Shift-01)

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$
(c) 13 (d) 1

46. Evaluate $\frac{(9\sin\theta + 2\cos\theta)}{(9\sin\theta - 2\cos\theta)}$, if $3\tan\theta = 4$.

SSC CHSL 10/07/2024 (Shift-02)

(a) $\frac{7}{5}$ (b) $\frac{9}{7}$
(c) $\frac{5}{7}$ (d) $\frac{6}{5}$

47. If $8\tan A = 5$, what is the value of $\frac{8\sin A - 7\cos A}{8\sin A + 11\cos A}$?

SSC Phase-XII 21/06/2024 (Shift-02)

(a) $\frac{1}{19}$ (b) $\frac{-1}{6}$
(c) $\frac{-1}{8}$ (d) $\frac{1}{8}$

48. If $\cot A = \frac{5}{12}$, find the value of the following expression. $\frac{5(1-\cos^2 A)}{6(1-\sin^2 A)}$

SSC CHSL 09/08/2023 (Shift-02)

(a) $\frac{144}{5}$ (b) $\frac{24}{25}$
(c) $\frac{144}{25}$ (d) $\frac{24}{5}$

49. If $2\cot\theta = 3$, then find the value of $\frac{\sqrt{13}\sin\theta - 3\tan\theta}{3\tan\theta + \sqrt{13}\cos\theta}$

SSC CGL 24/07/2023 (Shift-01)

(a) $\frac{1}{\sqrt{13}}$ (b) $\frac{2}{\sqrt{13}}$
(c) 0 (d) $\frac{2}{3}$

50. If $\cos\theta = \frac{12}{13}$, then the value of $\frac{\sin\theta(1-\tan\theta)}{\tan\theta(1+\mathrm{cosec}\,\theta)}$ is:

SSC CGL TIER-II 03/02/2022

(a) $\frac{25}{78}$ (b) $\frac{35}{234}$
(c) $\frac{35}{108}$ (d) $\frac{25}{156}$

51. If $\sin A = \frac{1}{2}$, A is an acute angle, then find the value of $\frac{\tan A - \cot A}{\sqrt{3}(1+\mathrm{cosec}A)}$.

SSC CGL 17/08/2021 (Shift-02)

(a) $-\frac{2}{9}$ (b) $-\frac{4\sqrt{3}}{9}$
(c) $\frac{4\sqrt{3}}{9}$ (d) $\frac{2}{9}$

52. If $2\tan\theta = 3$, then $\frac{3\sin\theta - 2\cos\theta}{3\sin\theta + 2\cos\theta}$ is equal to:

SSC CGL 10/09/2024 (Shift-02)

(a) $\frac{6}{13}$ (b) $\frac{6}{7}$
(c) $\frac{5}{7}$ (d) $\frac{5}{13}$

53. If $7\tan\theta = 3$, and θ is an acute angle, then $\frac{5\sin\theta - \cos\theta}{5\sin\theta + 2\cos\theta}$ is equal to

SSC CGL 10/09/2024 (Shift-03)

(a) $\frac{8}{29}$ (b) $\frac{11}{29}$
(c) $\frac{7}{29}$ (d) $\frac{9}{29}$

54. If $7\tan\theta = 3$, then $\frac{7\sin\theta + 5\cos\theta}{7\sin\theta - 2\cos\theta}$ is:

SSC CGL 12/09/2024 (Shift-02)

(a) 7 (b) 5
(c) 8 (d) 6

55. If $7\cos A = 6$. then the numerical value of $\frac{\mathrm{cosec}A + \cot A}{\mathrm{cosec}A - \cot A}$ is:

SSC CGL 12/09/2024 (Shift-03)

(a) 1 (b) 0
(c) 13 (d) -13

56. If $\tan A = \frac{5}{7}$, then find the value of $\frac{7\sin A - 3\cos A}{7\sin A + 3\cos A} + 4$.

SSC CGL 13/09/2024 (Shift-02)

(a) $4\frac{1}{4}$ (b) $3\frac{5}{7}$
(c) $3\frac{1}{5}$ (d) $7\frac{1}{3}$

57. If $\sin\theta = \frac{5}{13}$, then what is the value of $\frac{\cos^2\theta - \sin^2\theta}{2\cos\theta.\sin\theta}$?

SSC CHSL 17/03/2023 (Shift-03)

(a) $\frac{15}{126}$ (b) $\frac{13}{120}$
(c) $\frac{17}{136}$ (d) $\frac{119}{120}$

58. If $\frac{7\sin\theta + 4\cos\theta}{9\sin\theta - 2\cos\theta} = \frac{5}{4}$, then the value of $\frac{\tan^2\theta + 5}{\tan^2\theta - 5}$ is:

SSC CGL 09/09/2024 (Shift-03)

(a) $\frac{2121}{769}$ (b) $-\frac{2121}{769}$
(c) $\frac{769}{2121}$ (d) $-\frac{769}{2121}$

59. If $\frac{\sec\alpha + \tan\alpha}{\sec\alpha - \tan\alpha} = \frac{7}{4}$, then find the value of $\mathrm{cosec}\alpha$.

SSC CGL 09/09/2024 (Shift-03)

(a) $\frac{1}{3}$ (b) $\frac{1}{11}$
(c) $\frac{11}{3}$ (d) $\frac{3}{11}$

60. If $\mathrm{cosec}x = \frac{5}{4}$, then the value of $\frac{5\sin^2 x + 8\cot^2 x}{27\tan^2 x - 125\cos^2 x}$ is:

SSC CGL 17/09/2024 (Shift-03)

(a) $\frac{33}{91}$ (b) $\frac{77}{30}$
(c) $\frac{55}{87}$ (d) $\frac{99}{47}$

61. If $\cot\theta = \sqrt{11}$, then the value of $\frac{\mathrm{cosec}^2\theta - \sec^2\theta}{\mathrm{cosec}^2\theta + \sec^2\theta}$

SSC CGL 26/09/2024 (Shift-03)

(a) $\frac{3}{5}$ (b) $\frac{5}{6}$
(c) $\frac{4}{5}$ (d) $\frac{6}{7}$

62. If $\frac{2\sin A - \cos A}{\sin A + \cos A} = 1$, then find the value of cot A.

SSC CPO 05/10/2023 (Shift-03)

(a) 1 (b) 2
(c) $\frac{1}{2}$ (d) $\frac{1}{3}$

63. If $\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}=\frac{4}{5}$, then the value of $\frac{\operatorname{cosec}^2\theta}{2-\operatorname{cosec}^2\theta}$ is:

SSC CHSL 09/08/2023 (Shift-01)

(a) $\frac{16}{25}$ (b) $\frac{40}{41}$

(c) $\frac{41}{40}$ (d) $\frac{31}{30}$

64. If $\frac{\cos\beta}{\sec\alpha}=15$ and $\frac{\sin\beta}{\sec\alpha}=16$, then the value of $\sin^2\beta$ is ____.

SSC CGL 14/07/2023 (Shift-03)

(a) $\frac{256}{481}$ (b) $-\frac{256}{481}$

(c) $\frac{481}{256}$ (d) $-\frac{481}{256}$

65. If $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}=5$, then the value of $\frac{4\sin^2\theta+3}{2\cos^2\theta+2}$ is:

SSC CGL 24/08/2021 (Shift-03)

(a) $\frac{75}{34}$ (b) $\frac{75}{17}$

(c) $\frac{3}{2}$ (d) $\frac{1}{2}$

66. If $\frac{(\sec A+\tan A)}{\sec A-\tan A}=2\frac{51}{79}$, then the value of sinA is equal to:

SSC CPO 28/06/2024 (Shift-01)

(a) $\frac{77}{144}$ (b) $\frac{61}{169}$

(c) $\frac{87}{169}$ (d) $\frac{65}{144}$

67. If $\frac{21\cos A+3\sin A}{3\cos A+4\sin A}=2$, then find the value of cot A

SSC CGL 26/07/2023 (Shift-02)

(a) $\frac{9}{11}$ (b) $\frac{11}{9}$

(c) $\frac{1}{3}$ (d) $\frac{11}{10}$

68. If $\frac{\sec\theta-\tan\theta}{\sec\theta+\tan\theta}=\frac{1}{7}$, θ lies in first quadrant, then the value of $\frac{\operatorname{cosec}\theta+\cot^2\theta}{\operatorname{cosec}\theta-\cot^2\theta}$ is:

SSC CGL TIER-II 03/02/2022

(a) $\frac{19}{5}$ (b) $\frac{22}{3}$

(c) $\frac{37}{12}$ (d) $\frac{37}{19}$

69. If $\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta}=2\frac{51}{79}$, then the value of sinθ is equal to :

SSC CGL TIER-II 18/11/2020

(a) $\frac{65}{144}$ (b) $\frac{35}{72}$

(c) $\frac{91}{144}$ (d) $\frac{39}{72}$

70. If $\tan\theta=\frac{3}{10}$, then find the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$.

SSC CPO 27/06/2024 (Shift-03)

(a) $\frac{100}{7}$ (b) $\frac{100}{3}$

(c) $\frac{100}{9}$ (d) $\frac{50}{3}$

71. If $\cot\theta=\frac{4}{3}$, then evaluate

$$\frac{(\sec\theta(1+\cot^2\theta)(\operatorname{cosec}^2\theta-\cot^2\theta))}{\operatorname{cosec}^3\theta}.$$

SSC CGL 10/09/2024 (Shift-02)

(a) $\frac{3}{4}$ (b) $\frac{4}{5}$

(c) $\frac{4}{3}$ (d) $\frac{3}{5}$

72. If $\frac{\sec\theta-\tan\theta}{\sec\theta+\tan\theta}=\frac{1}{9}$, θ lies in the firs quadrant, then the value of $\frac{\sin\theta-\tan^2\theta}{\sin\theta+\tan^2\theta}$ is:

SSC CGL TIER-II (18/01/2025)

(a) $-\frac{13}{27}$ (b) $-\frac{11}{29}$

(c) $\frac{13}{27}$ (d) $\frac{11}{29}$

73. ΔRMS is right-angled at M. The length of the base, RM = 4cm and the length of perpendicular MS = 3cm. Find the value of sec R.

SSC CHSL 10/08/2023 (Shift-03)

(a) $\frac{3}{4}$ (b) $\frac{5}{4}$

(c) $\frac{4}{5}$ (d) $\frac{2}{5}$

74. In ΔABC, AB = 20 cm, BC = 21 cm and AC = 29 cm. What is the value of cot C + cosec C – 2 tanA?

SSC CGL 16/08/2021 (Shift-02)

(a) $\frac{9}{20}$ (b) $\frac{7}{20}$

(c) $\frac{2}{5}$ (d) $\frac{3}{5}$

75. In ΔABC, right angled at B, if $\cot A=\frac{1}{2}$, then the value of $\frac{\sin A(\cos C+\cos A)}{\cos C(\sin C-\sin A)}$ is:

SSC CGL 24/08/2021 (Shift-01)

(a) –3 (b) 2

(c) 3 (d) –2

76. In ΔPQR, ∠Q = 90°. If $\tan R=\frac{1}{3}$, then what is the value of $\frac{\sec P(\cos R+\sin P)}{\operatorname{cosec}R(\sin R-\operatorname{cosec}P)}$?

SSC CGL 18/08/2021 (Shift-02)

(a) $-\frac{2}{7}$ (b) $\frac{18}{7}$

(c) $\frac{2}{7}$ (d) $-\frac{18}{7}$

77. In a ΔABC right - angled at C, if tan A = $\sqrt{3}$ then the value of sin A cos B cot (A + B) is:

SSC CGL 11/09/2024 (Shift-01)

(a) $\sqrt{3}$ (b) 1

(c) 0 (d) 2

78. In a triangle ABC, the ∠ABC = 90°. If $\sin(A)=\frac{1}{2}$, then cos(C) is equal to:

SSC CGL 11/09/2024 (Shift-02)

(a) $\frac{1}{\sqrt{2}}$ (b) 1

(c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{2}$

79. In a right angle ΔABC, ∠B = 90°, if tanA = 1, then 4sinA cosA =________.

SSC CGL 17/09/2024 (Shift-01)

(a) 1 (b) 2

(c) $\frac{1}{2}$ (d) 4

80. In a ΔABC, right angled at B if tanC = $\sqrt{3}$, then find $\frac{\sin^2 C+\cos^2 C}{1+\cot^2 C}$.

SSC CGL 26/09/2024 (Shift-02)

(a) $\frac{3}{4}$ (b) $\frac{16}{3}$

(c) $\frac{4}{15}$ (d) $\frac{3}{16}$

81. In right angled triangle ABC, ∠B = 90° and angle C are acute angles. If cosesA = $2\sqrt{2}$, then find the value of sinA. cosC + cosA. sinC.

SSC CHSL 01/07/2024 (Shift-01)

(a) 0 (b) $2\sqrt{2}$

(c) 1 (d) $\sqrt{2}$

82. In ΔABC, ∠B = 90° and AB : BC = 1 : 2. The value of cos A + tan C is.

SSC CPO 04/10/2023 (Shift-01)

(a) $\frac{1+\sqrt{5}}{2\sqrt{5}}$ (b) $\frac{2\sqrt{5}}{2+\sqrt{5}}$

(c) $\frac{5+\sqrt{5}}{2\sqrt{5}}$ (d) $\frac{2+\sqrt{5}}{2\sqrt{5}}$

83. ΔPQR is right angled at Q. If PQ = 12 cm, PR = 13 cm, find tanP + cotR.

SSC CHSL 09/08/2023 (Shift-01)

(a) $\frac{9}{10}$ (b) 0

(c) $\frac{10}{12}$ (d) $\frac{12}{10}$

84. ABC is a right trianlge. If ∠B = 90° and tan A = $\frac{1}{\sqrt{3}}$, then the value of sinA cosC + cosA sinC is:

SSC CGL 26/07/2023 (Shift-02)

(a) 1 (b) 2

(c) $\frac{2}{3}$ (d) $\frac{1}{3}$

85. Consider a triangle PQR, right angled at R, in which PQ = 29 units, QR = 21 units and ∠PQR = θ. Find the value of $\cos^2\theta - \sin^2\theta$.

SSC CGL 11/09/2024 (Shift-03)

(a) $\frac{21}{841}$ (b) 1

(c) $\frac{20}{841}$ (d) $\frac{41}{841}$

86. If sec31° = x, then $\sin^2 59° + \frac{1}{\sec^2 31°} - \frac{1}{\sin^2 59° \operatorname{cosec}^2 59°}$ is equal to:

SSC CGL 24/08/2021 (Shift-03)

(a) $\frac{x^2-2}{x}$ (b) $\frac{2-x^2}{x^2}$

(c) $\frac{x^2-2}{x^2}$ (d) $\frac{2-x^2}{x}$

87. If cos27° = $\frac{p}{q}$, then find the value of cosec27° − cos63°.

SSC CGL TIER-II (20/01/2025)

(a) $\frac{q^2}{p\sqrt{q^2-p^2}}$ (b) $\frac{p^2}{q\sqrt{q^2-p^2}}$

(c) $\frac{q}{p\sqrt{q^2-p^2}}$ (d) $\frac{p}{q\sqrt{q^2-p^2}}$

88. If cos 24° = $\frac{m}{n}$, then the value of (cosec24° − cos 66°) is:

SSC CGL 17/09/2024 (Shift-01)

(a) $\frac{m^2}{n\sqrt{m^2-n^2}}$ (b) $\frac{n^2}{m\sqrt{m^2-n^2}}$

(c) $\frac{n^2}{m\sqrt{n^2-m^2}}$ (d) $\frac{m^2}{n\sqrt{n^2-m^2}}$

89. If $\sin\theta = \frac{2xy}{x^2+y^2}$, then the value of tanθ is:

SSC CHSL 01/07/2024 (Shift-02)

(a) $\frac{2xy}{x^2-y^2}$ (b) $\frac{x^2+y^2}{x^2-y^2}$

(c) $\frac{x^2-y^2}{2xy}$ (d) $\frac{x^2-y^2}{x^2+y^2}$

90. If A is an acute angle, what is the value of cosec A, if cot A = $\frac{2p}{p^2-1}$?

SSC Phase-XII 26/06/2024 (Shift-02)

(a) $\frac{2p}{p^2+1}$ (b) $\frac{2^2}{p^2-1}$

(c) $\frac{p^2+1}{p^2-1}$ (d) $\frac{p^2-1}{p^2+1}$

91. If sin23° = $\frac{a}{b}$, then the value of sec23° − sin67° is ______.

SSC CGL 14/07/2023 (Shift-03)

(a) $\frac{a^2}{\sqrt{b^2-a^2}}$ (b) $\frac{b^2-a^2}{ab}$

(c) $\frac{a^2}{b\sqrt{b^2+a^2}}$ (d) $\frac{a^2}{b\sqrt{b^2-a^2}}$

92. If cos 48° = $\frac{m}{n}$ then, sec 48° − cot 42° is equal to:

SSC CPO 10/11/2022 (Shift-01)

(a) $\frac{m-\sqrt{n^2-m^2}}{m}$ (b) $\frac{m-\sqrt{n^2-m^2}}{m}$

(c) $\frac{m-\sqrt{n^2-m^2}}{m}$ (d) $\frac{n-\sqrt{n^2-m^2}}{m}$

93. If cos53° = $\frac{x}{y}$, then sec 53° + cot 37° is equal to:

SSC CGL 19/04/2022 (Shift-02)

(a) $\frac{y+\sqrt{y^2-x^2}}{x}$ (b) $\frac{x+\sqrt{y^2-x^2}}{y}$

(c) $\frac{y+\sqrt{y^2-x^2}}{y}$ (d) $\frac{y-\sqrt{y^2-x^2}}{x}$

94. If $\sin\theta = \frac{2\sqrt{ab}}{a+b}$, a > b > 0, then the value of $\frac{\cos\theta+1}{\cos\theta-1}$ will be:

SSC CHSL 19/04/2021 (Shift-02)

(a) $-\frac{a}{b}$ (b) $\frac{a}{b}$

(c) $-\frac{b}{a}$ (d) $\frac{b}{a}$

95. If $\cos\theta = \frac{P^2-1}{P^2+1}$, 0° < θ < 90°, then cosecθ is equal to:

SSC CHSL 05/08/2021 (Shift-02)

(a) $\frac{2P}{1-P^2}$ (b) $\frac{1+P^2}{2P}$

(c) $\frac{1-P^2}{2P}$ (d) $\frac{2P}{1+P^2}$

96. If secθ = $\frac{a}{b}$, b ≠ 0, then $\frac{1-\tan^2\theta}{2-\sin^2\theta}$ = ?

SSC CGL TIER-II 15/11/2020

(a) $\frac{a^2(2b^2+a^2)}{b^2(a^2-b^2)}$ (b) $\frac{a^2(2b^2+a^2)}{b^2(a^2+b^2)}$

(c) $\frac{a^2(2b^2-a^2)}{b^2(a^2+b^2)}$ (d) $\frac{a^2(2b^2-a^2)}{a^2(a^2+b^2)}$

97. If cosecθ = $\frac{b}{a}$, then $\frac{\sqrt{3}\cot\theta+1}{\tan\theta+\sqrt{3}}$ is equal to:

SSC CGL TIER-II 16/11/2020

(a) $\frac{\sqrt{b^2-a^2}}{a}$ (b) $\frac{\sqrt{a^2+b^2}}{a}$

(c) $\frac{\sqrt{a^2+b^2}}{b}$ (d) $\frac{\sqrt{b^2-a^2}}{b}$

◆ TYPE – II ◆
VALUES OF TRIGONOMETRIC RATIOS

98. What is the value of $\left(\frac{5}{\sqrt{3}} - \operatorname{cosec}60°\right)$?

SSC CGL 25/09/2024 (Shift-03)

(a) $\sqrt{3}$ (b) $\frac{2}{\sqrt{3}}$

(c) $3\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$

99. Simplify $\frac{\sin 60° - \cos 60°}{\sin 60° + \cos 60°}$

SSC CHSL 11/07/2024 (Shift-03)

(a) $2+\sqrt{3}$ (b) $\sqrt{3}-1$

(c) $2-\sqrt{3}$ (d) $\sqrt{3}-2$

100. Find the value of the following expression.

sin(30 + θ) − cos(60 − θ)

SSC CHSL 03/07/2024 (Shift-02)

(a) 0 (b) 2sin(30 − θ)

(c) $\frac{\sqrt{3}}{2}$ (d) 1

101. Find the value of the given expression.

$\frac{4}{3}\tan^2 45° + 3\cos^2 30° - 2\sec^2 30° - \frac{3}{4}\cot^2 60°$

SSC CGL 18/07/2023 (Shift-04)

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$

(c) $\frac{\sqrt{2}}{3}$ (d) $\frac{3}{\sqrt{2}}$

102. Find the value of $\frac{2}{3}\tan^2 60° + 3\cos^2 30° - 2\sec^2 30° - \frac{3}{4}\cot^2 60°$.

SSC CGL 20/07/2023 (Shift-03)

(a) 2.33 (b) 2.01

(c) 1.33 (d) 3.33

103. If secθ = $\sqrt{2}$, then cosecθ is equal to:

SSC CGL 24/09/2024 (Shift-01)

(a) 0 (b) $\sqrt{2}$

(c) −1 (d) 0

104. $16\cos^3\frac{\pi}{6} - 12\cos\frac{\pi}{6}$ is equal to:

SSC CGL 01/12/2022 (Shift-04)

(a) 0
(b) 2
(c) 1
(d) –1

105. Evaluate the following expression: $3\tan^2 45° + 2\cos 60° - 2\sin 30°$

SSC CHSL 26/05/2022 (Shift-03)

(a) 3
(b) 4
(c) 0
(d) 2

106. What is the value of $8\sqrt{3}\sin 30°\tan 60° - 3\cos 0° + 3\sin^2 45° + 2\cos^2 30$?

SSC CGL 11/04/2022 (Shift-02)

(a) 15
(b) 12
(c) 9
(d) 18

107. If $2k\sin 30°\cos 30°\cot 60° = \frac{\cot^2 30°\sec 60°\tan 45°}{\text{cosec}^2 45°\text{cosec} 30°}$, then find the value of k.

SSC CGL 12/04/2022 (Shift-03)

(a) $\frac{3}{2}$
(b) 3
(c) 1
(d) 6

108. Find the value of

$[\frac{4}{3}\tan^2 60° + 3\cos^2 30° - 2\sec^2 30° - \frac{3}{4}\cot^2 60°] \div [\sin 60°\cos 30° - \cos 60°\sin 30°]$

SSC CGL 11/09/2024 (Shift-02)

(a) $6\frac{2}{3}$
(b) $3\frac{1}{2}$
(c) $4\frac{1}{3}$
(d) $6\frac{3}{2}$

109. If $p\left(\sqrt{3} + \cot 30°\right) = \tan^3 60° - 2\sin 60°$, then the value of p is:

SSC CGL 13/09/2024 (Shift-01)

(a) –1
(b) $2\sqrt{3}$
(c) 1
(d) $\sqrt{3}$

110. Given $\theta_1 + \theta_2 = \frac{\pi}{2}$ & $\sin\theta_1 = \frac{1}{2}$ find the value of θ_2.

SSC CGL 27/07/2023 (Shift-01)

(a) $\frac{\pi}{4}$
(b) $\frac{\pi}{2}$
(c) $\frac{\pi}{3}$
(d) π

111. If $k(\tan 45° \sin 60°) = \cos 60° \cot 30°$, then the value of k is:

SSC CPO 04/10/2023 (Shift-01)

(a) 1
(b) $\frac{1}{\sqrt{3}}$
(c) $\sqrt{3}$
(d) 3

112. Find the value of cos0° + cos30° – tan 45° + cosec 60° + cot 90°.

SSC CHSL 03/08/2023 (Shift-01)

(a) $\frac{7}{6\sqrt{3}}$
(b) $\frac{\sqrt{3}}{6}$
(c) $\frac{7}{6}$
(d) $\frac{7}{2\sqrt{3}}$

113. Find the value of sin60° sec30° + tan45° cos0° + sec60° sin30°.

SSC CHSL 07/08/2023 (Shift-02)

(a) 0
(b) 3
(c) 1
(d) 2

114. At what angle θ, the value of sin (θ) and cos (θ) will have the same value?

SSC CGL 18/09/2024 (Shift-01)

(a) 45°
(b) 30°
(c) 60°
(d) 75°

115. The value of $\frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta + \cos^2\theta}$ at θ = 45° is:

SSC CGL 23/09/2024 (Shift-03)

(a) 1
(b) 0
(c) 3
(d) 2

116. If A = 15°, then what is the value of $\frac{11\sqrt{2}\cos 3A + 10\sin 2A}{7\sqrt{3}\sin 4A}$?

SSC CGL 24/09/2024 (Shift-03)

(a) $\frac{11}{7}$
(b) $\frac{21}{32}$
(c) $\frac{32}{21}$
(d) $\frac{7}{11}$

117. If $\tan\frac{\pi}{6} + \sec\frac{\pi}{6} = x$, then find x

SSC CGL 17/07/2023 (Shift-02)

(a) $\sqrt{3}$
(b) $\frac{1}{\sqrt{3}}$
(c) $\frac{-1}{\sqrt{3}}$
(d) $\frac{2}{\sqrt{3}}$

118. If $\frac{k - k\cot^2 30°}{1 + \cot^2 30°} = \sin^2 60° + 4\tan^2 45° - \text{cosec}^2 60°$, then the value of k (correct to two decimal places) is:

SSC CGL 03/12/2022 (Shift-03)

(a) 5.55
(b) –6.83
(c) –5.58
(d) 6.83

119. If $\frac{x - x\,\text{cosec}^2 30°}{1 + \text{cosec}^2 30°} = \cos^2 60° + 4\cot^2 45° - \sec^2 60°$, then the value of x is ______.

SSC CHSL 25/05/2022 (Shift-01)

(a) $\frac{5}{12}$
(b) $-\frac{5}{12}$
(c) $\frac{1}{5}$
(d) $\frac{-1}{12}$

120. If $\cot\theta = \frac{1}{\sqrt{3}}$ 0° < θ < 90°, then the value of $\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\text{cosec}^2\theta - \sec\theta)$ is:

SSC CPO 25/11/2020 (Shift-02)

(a) 5
(b) 0
(c) 1
(d) 2

121. If $3\tan\theta = 2\sqrt{3}\sin\theta$, $0° < \theta < 90°$, then the value of $\frac{\text{cosec}^2 2\theta + \cot^2 2\theta}{\sin^2\theta + \tan^2 2\theta}$ is:

SSC CGL TIER-II 29/01/2022

(a) $\frac{4}{13}$
(b) $\frac{20}{39}$
(c) $\frac{4}{3}$
(d) $\frac{20}{27}$

122. If $4\sin^2(2x - 10)° = 3$, $0° \le (2x - 10) \le 90°$, then find the value of $\frac{\sin^4(x-5)° + \cos^4(x-5)°}{1 - 2\sin^2(3x-15)°\cos^2(3x-15)°}$.

SSC CGL 17/08/2021 (Shift-02)

(a) 1
(b) $\frac{5}{8}$
(c) $-\frac{5}{8}$
(d) –1

123. If $3(\cot^2\phi - \cos^2\phi) = \cos^2\phi$, $0° < \phi < 90°$, then the value of $(\tan^2\phi + \text{cosec}^2\phi + \sin^2\phi)$ is :

SSC CGL TIER-II 12/09/2019

(a) $\frac{13}{3}$
(b) $\frac{61}{12}$
(c) $\frac{25}{12}$
(d) $\frac{15}{4}$

124. If $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$, $0° < \theta < 90°$, then the value of cotθ + cosecθ is :

SSC CGL 06/06/2019 (Shift-02)

(a) $\sqrt{3}$
(b) $\frac{\sqrt{3}}{2}$
(c) $2\sqrt{3}$
(d) $\frac{3\sqrt{3}}{4}$

125. $\frac{\tan(x)}{\sec(x)} = \frac{1}{2}$, then the value of $(\sin x + \cos x)^2$ is ______.

SSC CGL 13/09/2024 (Shift-02)

(a) $\frac{2+\sqrt{3}}{3}$
(b) $\frac{2+\sqrt{3}}{2}$
(c) $\frac{2-\sqrt{3}}{2}$
(d) $\frac{2-\sqrt{3}}{3}$

126. If $\sin\theta + \cos\theta = \sqrt{3}\cos\theta$, then the value of cotθ is:

SSC CGL 17/09/2024 (Shift-03)

(a) $\sqrt{3} - 1$
(b) $\frac{(\sqrt{3}+1)}{2}$
(c) $\frac{(\sqrt{3}-1)}{2}$
(d) $\sqrt{3} + 1$

127. If $\cot^2\theta - 2\cos^2\theta = 0$, $(0° < \theta < 90°)$, then find the value of θ ?

SSC CGL 25/09/2024 (Shift-02)

(a) 45° (b) 60°
(c) 90° (d) 30°

128. If $\sin^4\theta + \cos^4\theta = 2\sin^2\theta\cos^2\theta$, $0°<\theta<90°$, then find the value of $\cot\theta$.

SSC CPO 29/06/2024 (Shift-01)

(a) $\frac{1}{2}$ (b) $\frac{1}{\sqrt{2}}$
(c) $\frac{1}{2}$ (d) 1

129. If $(\sin\theta - \cos\theta) = 0$, then the value of $\sin(\pi - \theta) + \sin\left(\frac{\pi}{2} - \theta\right)$ is:

SSC CHSL 02/08/2023 (Shift-02)

(a) 1 (b) 0
(c) $\sqrt{3}$ (d) $\sqrt{2}$

130. If $4\sin^2A - 3 = 0$ and $0 \le A \le 90°$, then $3\sin A - 4\sin^3 A$ is:

SSC CHSL 10/08/2023 (Shift-01)

(a) $\frac{1}{2}$ (b) $\sqrt{\frac{3}{2}}$
(c) 0 (d) 1

131. If $4\sin^2\theta = 3(1 + \cos\theta)$, $0° < \theta < 90°$, then what is the value of $(2\tan\theta + 4\sin\theta - \sec\theta)$?

SSC CGL 11/04/2022 (Shift-01)

(a) $3\sqrt{15} - 4$ (b) $15\sqrt{3} - 4$
(c) $15\sqrt{3} + 3$ (d) $4\sqrt{15} - 3$

132. If $3\tan\theta = 2\sqrt{3}\sin\theta$, $0°< \theta < 90°$, then find the value of $2\sin^2 2\theta - 3\cos^2 3\theta$.

SSC CGL 13/08/2021 (Shift-03)

(a) 1 (b) $\frac{3}{2}$
(c) $\frac{1}{2}$ (d) $\frac{-3}{2}$

133. If $\sin\left(\frac{2A+B}{2}\right) = \cos\left(\frac{2A-B}{2}\right) = \frac{\sqrt{3}}{2}, 0° < \frac{2A+B}{2} < 90$ and $0° < \frac{2A+B}{2} < 90°$ then find the value of $\sin[3(A - B)]$.

SSC CGL 16/08/2021 (Shift-03)

(a) 1 (b) $\frac{1}{\sqrt{2}}$
(c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

134. If $\sin(x + y) = 1$ and $\cos(x - y) = \frac{\sqrt{3}}{2}$, find the value of 'y'.

SSC CPO 28/06/2024 (Shift-03)

(a) 90° (b) 60°
(c) 30° (d) 20°

135. If $\sin(p + q) = 1$ and $\cos(p - q) = \frac{\sqrt{3}}{2}$, find p.

SSC CHSL 03/08/2023 (Shift-04)

(a) 90° (b) 80°
(c) 60° (d) 120°

136. If $\sin(A - B) = \frac{1}{2}$, and $\sin(A + B) = 1$, where A and B are positive acute angles and $A \ge B$, then A and B are respectively:

SSC CHSL 04/08/2023 (Shift-04)

(a) 80°, 10° (b) 60°, 30°
(c) 70°, 20° (d) 50°, 40°

137. If A, B, C are the acute angles, such that $\tan(A + B - C) = \frac{1}{\sqrt{3}}$, $\cos(B + C - A) = \frac{1}{2}$ and $\sin(C + A - B) = \frac{1}{\sqrt{2}}$. The value of A + B + C will be equal to:

SSC CHSL 10/08/2023 (Shift-04)

(a) 90° (b) 110°
(c) 170° (d) 135°

138. If $\sin(x - y) = \frac{1}{2}$ and $\cos(x + y) = \frac{1}{2}$, then what is the value of $\sin x\cos x + 2\sin^2 x + \cos^3 x\sec x$?

SSC CHSL 15/03/2023 (Shift-03)

(a) 2 (b) $\frac{3}{4}$
(c) $\sqrt{2}+1$ (d) 1

139. If $\tan(x + y) = 1$ and $\cos(x - y) = \frac{\sqrt{3}}{2}$, then what is the value of x and y?

SSC CHSL 16/03/2023 (Shift-04)

(a) $x = 3$, $y = 4.5$
(b) $x = 37.5$, $y = 7.5$
(c) $x = 7.5$, $y = 37.5$
(d) $x = 4.5$, $y = 3$

140. If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$; $0° < (A + B) < 90°$; $A > B$, then the values of A and B are _____.respectively.

SSC CGL TIER-II 02/03/2023

(a) 45° & 15° (b) 15° & 45°
(c) 30° & 30° (d) 60° & 30°

141. If $\cos 2\theta = 0$, where θ is an acute angle, then find the value of $\sin(75° - \theta)$.

SSC Phase-XII 26/06/2024 (Shift-03)

(a) $\frac{1}{2}$ (b) $\frac{1}{\sqrt{2}}$
(c) $\sqrt{2}-1$ (d) $\sqrt{2}+1$

142. If $P\sin 60° = Q\,\mathrm{cosec}\,45°$, then the value of $\frac{P^2+Q^2}{P^2-Q^2}$ is equal to:

SSC Phase-XII 26/06/2024 (Shift-04)

(a) $\frac{11}{7}$ (b) $\frac{11}{5}$
(c) $\frac{5}{11}$ (d) $\frac{7}{11}$

143. If $\alpha\sin 45° = \beta\,\mathrm{cose}30°$, then $\frac{\alpha^4}{\beta^4}$ is:

SSC CHSL 07/08/2023 (Shift-01)

(a) 4^4 (b) 3^3
(c) 2^3 (d) 4^3

144. If $\sin x = \frac{1}{2}$, then find the value of $(\sec^4 x + \mathrm{cosec}^4 x) - (\tan^4 x + \cot^4 x)$.

SSC CHSL 10/03/2023 (Shift-02)

(a) $\frac{26}{3}$ (b) $\frac{26}{33}$
(c) $\frac{26}{33}$ (d) 2

145. If $\cos\theta - \sin\theta = \sqrt{3}\cos(90°-\theta)$, $0° < \theta < 90°$ then find the value of $\tan\theta - \cot\theta$.

SSC CGL 17/08/2021 (Shift-02)

(a) $\frac{3+2\sqrt{3}}{(1+\sqrt{3})}$ (b) $-\frac{3+2\sqrt{3}}{(1+\sqrt{3})}$
(c) $-\frac{3+2\sqrt{3}}{(1-\sqrt{3})}$ (d) $\frac{3-2\sqrt{3}}{(1+\sqrt{3})}$

◆ TYPE – III ◆
BASED ON QUADRANTS

146. If $\mu = 60°$, then $\sin\mu + \cos(90° - \mu)$ = _____.

SSC Phase-XII 25/06/2024 (Shift-03)

(a) $\sqrt{3}$ (b) $\frac{\sqrt{3}}{2}$
(c) $2\sqrt{3}$ (d) $\frac{1}{2}$

147. If $\tan(90° - \theta) = \frac{2}{\sqrt{3}}$, then the value of $2\sqrt{3}\tan\theta + 1$ is:

SSC CHSL 11/08/2023 (Shift-02)

(a) 4 (b) 5
(c) 3 (d) 6

148. The value of $\sin^2\frac{2\pi}{3} + \cos^2\frac{5\pi}{6} - \tan^2\frac{3\pi}{4}$ is:

SSC Phase-X 03/08/2022 (Shift-02)

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) 4 (d) 2

149. What is the simplified value of $\cos^2(90° - \theta) - \left[\frac{\{\cos(90° - \theta)\cos\theta\}}{\cot\theta}\right]$?

SSC CHSL 31/05/2022 (Shift- 3)

(a) 4 (b) 2
(c) 0 (d) 1

150. Express sin 74° + tan 74° in terms of trigonometric ratios of angles between 0° and 45°.

SSC CGL 11/09/2024 (Shift-03)

(a) sec16° + cot16°
(b) cos 16° + cot 16°
(c) cosec 16° + cot 16°
(d) cosec 16° + sec 16°

151. Find the value of

$$\left[\frac{4\cos(90-\theta)\sin^3(90+\theta)-4\sin(90+\theta)\cos^3(90-\theta)}{\cos\left(\frac{180+8\theta}{2}\right)}\right]$$

SSC CGL 17/09/2024 (Shift-02)

(a) −1 (b) 1
(c) 2 (d) 0

152. Evaluate the following.

$$\frac{5\cos^2 120° + 4\sec^2 30° - \tan^2 135°}{\sin^2 30° + \cos^2 30°}$$

SSC Phase-XII 25/06/2024 (Shift-02)

(a) $\frac{67}{12}$ (b) $\frac{57}{5}$
(c) $\frac{27}{5}$ (d) $\frac{37}{12}$

153. Find the exact value of sin150°.

SSC CGL 12/09/2024 (Shift-03)

(a) 1.5 (b) 0.5
(c) 0.75 (d) −0.5

154. What is the value of tan 570°

SSC CHSL 04/07/2024 (Shift-02)

(a) $-\frac{1}{\sqrt{3}}$ (b) $-\sqrt{3}$
(c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{3}$

155. If $\cos x = -\frac{1}{2}$, x lies in third quadrant, then tan$x$ = ?

SSC CGL 17/07/2023 (Shift-03)

(a) $\sqrt{3}$ (b) $\frac{\sqrt{3}}{2}$
(c) $\frac{2}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{3}}$

156. Find $\cos\left(-\frac{7\pi}{2}\right)$.

SSC CPO 10/11/2022 (Shift-03)

(a) $\frac{1}{2}$ (b) 1
(c) −1 (d) 0

157. cosec 2910° + sec 4260° + tan 2565° + cot 1755° = ?

SSC CGL 20/07/2023 (Shift-01)

(a) 3 (b) 1
(c) 4 (d) 0

158. Simplify

$$\frac{1}{\cos x}\sqrt{\frac{\cos(\pi+x)\cos(-x)}{\sin(\pi-x)\cos\left(\frac{\pi}{2}+x\right)}}$$

SSC Phase-X 04/08/2022 (Shift-03)

(a) tan x (b) cot x
(c) sec x (d) cosec x

159. If A is an acute angle, the simplified form of

$$\frac{\cos(\pi-A).\cot\left(\frac{\pi}{2}+A\right)\cos(-A)}{\tan(\pi+A)\tan\left(\frac{3\pi}{2}+A\right)\sin(2\pi-A)} \text{ is :}$$

SSC CGL 13/12/2022 (Shift-04)

(a) cos²A (b) sinA
(c) sin²A (d) cosA

◆ TYPE – IV (A) ◆
IF $\alpha + \beta = 90° \Rightarrow \alpha$ & β ARE COMPLEMENTARY

160. Evaluate the value of (cosec56° cos34° – cos59°cosec31°)

SSC CGL 11/09/2024 (Shift-02)

(a) 1 (b) 2
(c) −1 (d) 0

161. Find the value of cos47°sec133° + sin44°cosec136°.

SSC CGL 17/07/2023 (Shift-02)

(a) $\frac{1}{2}$ (b) 1
(c) 0 (d) −1

162. 2(sin 1° × sec 89°) + 3 (cos 11° × cosec 79°) + 5 (tan 21° × tan 69°) = ?

SSC CPO 04/10/2023 (Shift-02)

(a) 20 (b) 12
(c) 11 (d) 10

163. The value of cot 13° cot 27° cot 60° cot 63° cot 77° is:

SSC CHSL 02/08/2023 (Shift-02)

(a) $\frac{1}{\sqrt{3}}$ (b) 0
(c) $\sqrt{3}$ (d) 1

164. Simplify the following 7(cot 11° cot13° cot 19° cot 29° cot 61° cot 71° cot 77° cot 79°)

SSC CHSL 09/08/2023 (Shift-03)

(a) 7 (b) −7
(c) − 1 (d) 1

165. Find the value of $\frac{\tan 55°}{\cot 35°}$.

SSC CGL 18/09/2024 (Shift-02)

(a) cos35° (b) 1
(c) sec55° (d) 0

166. $\frac{3\sin 58°}{5\cos 32°} + \frac{2\cos 62°}{5\sin 28°}$ is equal to:

SSC CGL TIER-II 15/11/2020

(a) 0 (b) 2
(c) 3 (d) 1

167. Find the value of

$$\frac{\sec 35°}{\text{cosec}\,55°} - \frac{\cos 25°}{\sin 65°}$$

SSC CGL 11/09/2024 (Shift-01)

(a) 0 (b) 1
(c) $\frac{1}{2}$ (d) 2

168. Find the value of $2\frac{\tan 54°}{\cot 36°} - \frac{\cot 41°}{\tan 49°}$.

SSC CGL 25/09/2024 (Shift-01)

(a) −1 (b) 1
(c) 0 (d) 2

169. Find the value of $\frac{\cos 25° - \sin 65°}{\cos 25° + \sin 65°}$

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 1 (b) $\frac{1}{2}$
(c) −1 (d) 0

170. Evaluate:

$$7\left(\frac{\text{cosec}\,24°}{\sec 66°}\right)^3 + 8\left(\frac{\cot 37°}{\tan 53°}\right)^4 - \left(2\frac{\sec 14°}{\text{cosec}\,76°}\right)^2 + \left(-3\frac{\tan 82°}{\cot 8°}\right)^3$$

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 40 (b) 2
(c) −16 (d) 10

171. Find the value of

$$\frac{\cos 65°}{\sin 25°} + \frac{5\sin 19°}{\cos 71°} - \frac{3\cos 28°}{\sin 62°}.$$

SSC CPO 03/10/2023 (Shift-02)

(a) 3 (b) 2
(c) 1 (d) 0

172. Find the value of $\frac{\cos 37°}{\sin 53°}$ − cos 47° cosec 43°.

SSC CPO 04/10/2023 (Shift-01)

(a) −1 (b) 1
(c) 2 (d) 0

173. The value of $\frac{\cos 65°}{\sin 25°} + \frac{\cos 55°}{\sin 35°}$ − tan50° cot50° is equal to:

SSC CHSL 08/08/2023 (Shift-01)

(a) 2 (b) 0
(c) − 1 (d) 1

174. What is the value of

$\frac{\cos 50°}{\sin 40°} + \frac{3\,\text{cosec}80°}{\sec 10°}$ − 2 cos50°. cosec40° ?

SSC CGL TIER-II 08/08/2022

(a) 3 (b) 4
(c) 2 (d) 5

175. The value of $\frac{2\cos 15°\sin 15°}{\cos^2 15° - \sin^2 15°}$ is:

SSC CPO 29/06/2024 (Shift-02)

(a) $\frac{1}{\sqrt{3}}$ (b) ∞
(c) $\frac{\sqrt{5}-1}{\sqrt{5}+1}$ (d) $\sqrt{3}$

176. If tan(x + y)tan(x − y) = 1, then find the value of tan$x$.

SSC CGL TIER-II (18/01/2025)

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$
(c) 1 (d) $\frac{1}{2\sqrt{3}}$

177. If $\cos(2\theta + 54^\circ) = \sin\theta$, $0^\circ < (2\theta + 54^\circ) < 90^\circ$, then what is the value of $\dfrac{1}{\cot 5\theta + \sec\dfrac{5\theta}{2}}$?

SSC CGL 20/08/2021 (Shift- 02)

(a) $\dfrac{\sqrt{3}}{2}$ (b) $\dfrac{1}{3}$

(c) $\dfrac{\sqrt{3}}{3}$ (d) $2\sqrt{3}$

178. If $\sin 3A = \cos(A + 10^\circ)$, where 3A is an acute angle then what is the value of $2\operatorname{cosec}\dfrac{3A}{2} + 6\tan^2 3A - \dfrac{3}{2}\tan^2 3A$?

SSC CGL TIER-II 15/11/2020

(a) $\dfrac{7}{4}$ (b) $\dfrac{35}{2}$

(c) $\dfrac{17}{2}$ (d) 5

179. If $\sin 3A = \cos(A - 26^\circ)$ then A = ___ where 3A is an acute angle.

SSC CGL 24/09/2024 (Shift-01)

(a) 29° (b) 52°

(c) 26° (d) 78°

180. If $\sec 6A = \operatorname{cosec}(A - 29^\circ)$, where 2A is an acute angle, then the measure of ∠A = ___ °.

SSC CPO 27/06/2024 (Shift-01)

(a) 18° (b) 19°

(c) 21° (d) 17°

181. If $\sin(x + y) = \cos\{3(x + y)\}$, then, the value of $\cot\{2(x + y)\}$ is ______.

SSC CPO 29/06/2024 (Shift-02)

(a) –1 (b) 1

(c) –2 (d) 2

182. If $\sin(5x - 40^\circ) = \cos(5y + 40^\circ)$, then the value of $x + y$ is:

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 18° (b) 40°

(c) 15° (d) 20°

183. If $\cos(3\alpha) = \sin(\alpha - 22^\circ)$, where $3\alpha < 90^\circ$, then what is the value of α?

SSC CHSL 02/08/2023 (Shift-03)

(a) 29° (b) 26°

(c) 27° (d) 28°

184. If $\tan(5\theta - 10^\circ) = \cot(5\phi + 20^\circ)$, then the value of $\theta + \phi$ is:

SSC CHSL 10/08/2023 (Shift-02)

(a) 16° (b) 18°

(c) 15° (d) 20°

185. If $\sin(5x - 25^\circ) = \cos(5y + 25^\circ)$, where $5x - 25^\circ$ and $5y + 25^\circ$ are acute angles, then the value of $(x + y)$ is:

SSC CGL 18/07/2023 (Shift-03)

(a) 50° (b) 40°

(c) 18° (d) 16°

186. If $\cos\theta = \sin(2\theta) \neq 0$, what is the value of $\cos^4\theta + \sin^4\theta + \cos^3\theta + \sin^3\theta + \sin^2\theta + \cos^2\theta + \sin\theta + \cos\theta$?

SSC Phase-X 05/08/2022 (Shift-03)

(a) $\dfrac{18+8\sqrt{3}}{7}$ (b) $\dfrac{8+7\sqrt{3}}{18}$

(c) $\dfrac{7+18\sqrt{3}}{8}$ (d) $\dfrac{18+7\sqrt{3}}{8}$

187. If $\sec(5\alpha - 15^\circ) = \operatorname{cosec}(15^\circ - 2\alpha)$, then the value of $\cos 3\alpha + \sin 2\alpha + \cot\alpha$ is:

SSC PHASE-IX 2022

(a) $\dfrac{\sqrt{3}}{2}$ (b) $\dfrac{3\sqrt{3}}{2}$

(c) $\dfrac{\sqrt{3}(\sqrt{3}-1)}{2}$ (d) $\dfrac{\sqrt{3}(\sqrt{3}+1)}{2}$

◆ TYPE – IV (B) ◆
IF $\alpha + \beta = 90^\circ \Rightarrow \alpha$ & β ARE COMPLEMENTARY

188. Find the value of $\sin^2 35^\circ + \sin^2 55^\circ$ = ______

SSC CHSL 03/08/2023 (Shift-03)

(a) 0 (b) 1

(c) $2\sin 35^\circ$ (d) $2\sin 55^\circ$

189. The value of $\cos^2 29^\circ + \cos^2 61^\circ$ is:

SSC CGL 09/09/2024 (Shift-01)

(a) $\dfrac{\sqrt{3}}{2}$ (b) 2

(c) 1 (d) 0

190. The value of $\sin^2 30^\circ - \sin^2 40^\circ + \sin^2 45^\circ - \sin^2 55^\circ - \sin^2 35^\circ + \sin^2 45^\circ - \sin^2 50^\circ + \sin^2 60^\circ$ is:

SSC CGL 09/09/2024 (Shift-01)

(a) 1 (b) 2

(c) 4 (d) 0

191. The value of $\sin^2 15^\circ + \sin^2 25^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 55^\circ + \sin^2 65^\circ + \sin^2 75^\circ$ is:

SSC CPO 29/06/2024 (Shift-03)

(a) 4 (b) 7

(c) $\dfrac{7}{2}$ (d) $\dfrac{7}{3}$

192. What is the value of $\sec^2 54^\circ - \cot^2 36^\circ + \dfrac{3}{2}\sin^2 37^\circ \times \sec^2 53^\circ + \dfrac{2}{\sqrt{3}}\tan 60^\circ$?

SSC CGL 14/07/2023 (Shift-02)

(a) $\dfrac{1}{3}$ (b) $\dfrac{9}{2}$

(c) $\dfrac{3}{2}$ (d) $\dfrac{7}{2}$

193. The value of $\dfrac{\sin^2 30^\circ + \cos^2 60^\circ - \sec 35^\circ . \sin 55^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$

SSC CPO 23/11/2020 (Shift-02)

(a) $-\dfrac{1}{4}$ (b) $\dfrac{1}{4}$

(c) $-\dfrac{1}{8}$ (d) $\dfrac{1}{8}$

194. The value of
$\dfrac{\sin 23^\circ \cos 67^\circ + \sec 52^\circ \sin 38^\circ + \cos 23^\circ \sin 67^\circ + \operatorname{cosec} 52^\circ \cos 38^\circ}{\operatorname{cosec}^2 20^\circ - \tan^2 70^\circ}$

SSC CGL 11/04/2022 (Shift- 01)

(a) 3 (b) 4

(c) 2 (d) 0

195. The value of
$$\dfrac{3(\cot^2 47^\circ - \sec^2 43^\circ) - 2(\tan^2 23^\circ - \operatorname{cosec}^2 67^\circ)}{\operatorname{cosec}^2(68^\circ + \theta) - \tan(\theta + 61^\circ) - \tan^2(22^\circ - \theta) + \cot(29^\circ - \theta)}$$

SSC CGL TIER-II 29/01/2022

(a) 1 (b) 0

(c) 5 (d) –1

196. The value of $\dfrac{2\sin^2 38^\circ \sec^2 52^\circ + \cos 64^\circ \sin 26^\circ + \sin^2 64^\circ}{\tan^2 23^\circ + \cot^2 23^\circ - \sec^2 67^\circ - \operatorname{cosec}^2 67^\circ}$ is:

SSC CGL TIER-II 15/10/2020

(a) – 2 (b) $\dfrac{3}{2}$

(c) 2 (d) $-\dfrac{3}{2}$

197. What is the value of $\sqrt{\dfrac{9\sin^2 26^\circ + 9\sin^2 64^\circ + 36}{32 - 7\cos^2 32^\circ - 7\cos^2 58^\circ}}$

SSC CGL 18/09/2024 (Shift-03)

(a) $\dfrac{3\sqrt{5}}{5}$ (b) $\dfrac{5\sqrt{3}}{3}$

(c) $\dfrac{5\sqrt{5}}{3}$ (d) $\dfrac{3\sqrt{3}}{5}$

198. Evaluate:
$$\left(\dfrac{\sin 23^\circ \cos 67^\circ + \cos 23^\circ \sin 67^\circ}{\operatorname{cosec}^2 15^\circ - \tan^2 75^\circ}\right)^3$$

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 1 (b) 0

(c) –1 (d) 8

199. If A + B = 90°, then the expression $\dfrac{\cot A}{\cot B} + \cos^2 A + \cos^2 B$ is equal to:

SSC CPO 03/10/2023 (Shift-03)

(a) $\cot^2 B$ (b) $\operatorname{cosec}^2 A$

(c) $\operatorname{cosec}^2 B$ (d) $\cot^2 A$

200. The value of
$$\dfrac{[\tan^2(22^\circ - \theta) - \tan^2(\theta + 68^\circ) - \operatorname{cosec}^2(68^\circ + \theta) + \cot^2(22^\circ - \theta)]}{[3(\cot^2 52^\circ - \sec^2 38^\circ) + 2(\operatorname{cosec}^2 28^\circ - \tan^2 62^\circ)]}$$

SSC PHASE-IX 2022

(a) 0 (b) -1

(c) 1 (d) $\dfrac{1}{5}$

201. The value of
$$\dfrac{4\tan^2 30^\circ + \sin^2 30^\circ \cos^2 45^\circ + \sec^2 48^\circ - \cot^2 42^\circ}{\cos 37^\circ \sin 53^\circ + \sin 37^\circ \cos 53^\circ + \tan 18^\circ \tan 72^\circ}$$

SSC CGL TIER-II 29/01/2022

(a) $\dfrac{35}{48}$ (b) $\dfrac{59}{48}$

(c) $\dfrac{49}{24}$ (d) $\dfrac{35}{24}$

202. The value of

$$\frac{3(\operatorname{cosec}^2 26° - \tan^2 64°) + (\cot^2 42° - \sec^2 48°)}{\cot(22° - \theta) - \operatorname{cosec}^2(62° + \theta) - \tan(\theta + 68°) + \tan^2(28° - \theta)}$$

SSC CGL TIER-II 03/02/2022

(a) 3 (b) 4

(c) –1 (d) –2

203. The value of

$$\frac{(\cos 9° + \sin 81°)(\sec 9° + \operatorname{cosec} 81°)}{\operatorname{cosec}^2 71° + \cos^2 15° - \tan^2 19° + \cos^2 75°}$$

is:

SSC CGL TIER-II 03/02/2022

(a) 1 (b) 4

(c) – 3 (d) 2

• TYPE – V (A) •
TRIGONOMETRIC IDENTITIES (BASIC QUESTIONS.)

204. Select the INCORRECT formula from the following options.

SSC CGL 17/07/2023 (Shift-01)

(a) $\sec^2\theta - \tan^2\theta = 1$

(b) $\sin^2\theta + \cos^2\theta = 1$

(c) $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

(d) $\sec^2\theta + \cos^2\theta = 1$

205. Select the correct identity from the following options.

SSC CHSL 07/06/2022 (Shift-002)

(a) $1 + \cos^2 A = \sin^2 A$

(b) $1 + \sin^2 A = \cos^2 A$

(c) $1 + \tan^2 A = \sec^2 A$

(d) $1 + \sec^2 A = \tan^2 A$

206. Select the incorrect formula from the following options.

SSC CGL TIER-II 03/03/2023

(a) $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

(b) $\sin^2\theta + \cos^2\theta = 1$

(c) $\sec^2\theta + \cos^2\theta = 1$

(d) $\sec^2\theta - \tan^2\theta = 1$

207. Which of the following is FALSE statement?

SSC CGL 18/07/2023 (Shift-03)

(a) $\tan^2 A = 1 - \sec^2 A$

(b) $\sin A = \tan A \times \cos A$

(c) $\operatorname{cosec}^2 A - 1 = \cot^2 A$

(d) $\cos A \times \sec A = 1$

208. $\sec\theta\sqrt{1 - \sin^2\theta} = ?$

SSC CGL 25/07/2023 (Shift-02)

(a) –1 (b) 1

(c) ∞ (d) 0

209. Solve the following equation.

$$\sec^2\theta(\sqrt{1 - \sin^2\theta})$$

SSC CPO 10/11/2022 (Shift-01)

(a) $\tan\theta$ (b) $\operatorname{cosec}\theta$

(c) $\sec\theta$ (d) 1

210. Which of the following is equal to $\frac{1}{\tan\theta} + \tan\theta$?

SSC CGL TIER-II 08/08/2022

(a) $\frac{\operatorname{cosec}\theta}{\sec\theta}$ (b) $\tan^2\theta$

(c) $\sec\theta.\ \operatorname{cosec}$ (d) 1

211. The given expression $\frac{\cos^2 A}{(1 + \sin A)}$ is equal to.

SSC CHSL 07/08/2023 (Shift-03)

(a) cos A (b) 1 + cos A

(c) sin A (d) 1 – sin A

212. What is the value of $\frac{1 + \sin A}{\cos^2 A}$?

SSC CHSL 13/03/2023 (Shift-01)

(a) $\frac{1}{1 - \sin A}$ (b) $\frac{1}{1 + \sin A}$

(c) $\frac{1}{1 + \cos A}$ (d) $\frac{1}{1 - \cos A}$

213. Which of the following is equal to $\left[\frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}\right]$?

SSC CGL TIER-II 08/08/2022

(a) $\cot\theta.\sec\theta$ (b) $\operatorname{cosec}\theta.\sec\theta$

(c) $\sec\theta.\tan\theta$ (d) $\operatorname{cosec}\theta.\ \tan\theta$

214. The value of $\frac{32}{\sec^2\theta} - \frac{20}{1 + \tan^2\theta} + 12\sin^2\theta$ is:

SSC Phase-XI 27/06/2023 (Shift-04)

(a) 20 (b) 32

(c) 24 (d) 12

215. Find the value of $\frac{2\sin\theta}{\sqrt{4 - 4\sin^2\theta}}$

SSC Phase-X 04/08/2022 (Shift-03)

(a) $2\tan\theta$ (b) $\tan\theta$

(c) $2\cot\theta$ (d) $\cot\theta$

216. Simplify the following:

$(1 + \cot^2\theta)(1 - \cos\theta)(1 + \cos\theta)$

SSC CPO 10/11/2022 (Shift-03)

(a) 1 (b) –5

(c) 3 (d) –3

217. The value of (cosec A + cot A) (1 – cosA) is:

SSC CPO 10/11/2022 (Shift-03)

(a) cos A (b) tan A

(c) cot A (d) sin A

218. Which of the following is equal to secA – cosA?

SSC CGL TIER-II 08/08/2022

(a) sinA. cotA (b) cotA. cosA

(c) tanA. sinA (d) cosA sinA

219. The given expression is equal to

$$1 - \frac{\tan^2\phi}{\sec^2\phi}$$

SSC CHSL 07/08/2023 (Shift-01)

(a) $\sin^2\phi\cos^2\phi$ (b) $\sin^2\phi\cot^2\phi$

(c) $\cot^2\phi\cos^2\phi$ (d) $\tan^2\phi\cos^2\phi$

220. The value of $(\operatorname{cosec}^2 B - 1)(\sec^2 B - 1)$ is:

SSC CHSL 03/08/2023 (Shift-02)

(a) 4 (b) 3

(c) 2 (d) 1

221. $\cos^4 A - \sin^4 A$ is equal to:

SSC CHSL 03/08/2023 (Shift-03)

(a) $2\cos^2 A + 1$ (b) $1 - 2\sin^2 A$

(c) $2\sin^2 A - 1$ (d) $-(2\sin^2 A + 1)$

222. Find the value of

$\operatorname{cosec}\theta\ (1 - \cos\theta)\ (\operatorname{cosec}\theta + \cot\theta)$.

SSC CPO 27/06/2024 (Shift-02)

(a) –1 (b) 2

(c) 0 (d) 1

223. $(1 - \cos^2 A)\sec^2 A$ is equal to

SSC CPO 28/06/2024 (Shift-02)

(a) $\cos^2 A\cot^2 A$ (b) $\tan^2 A$

(c) $\cot^2 A$ (d) $\operatorname{cosec}^2 A$

224. The value of $\sec x - \cos x = ?$

SSC CGL 21/07/2023 (Shift-02)

(a) $\tan x\sin x$ (b) $\sec x\tan x$

(c) $\tan x\cos x$ (d) $\sec x\cos x$

225. Solve the following.

$$\frac{1}{1 + \cos\theta} + \frac{1}{1 - \cos\theta} = ?$$

SSC CGL 12/09/2024 (Shift-02)

(a) $2\operatorname{cosec}^2\theta$ (b) $2\sin^2\theta$

(c) $2\sec^2\theta$ (d) $2\tan^2\theta$

226. If $\frac{1}{1 - \sin\theta} + \frac{1}{1 + \sin\theta} = 4\sec\theta$, $(0 < \theta < 90°)$, then the value of $(\cot\theta + \operatorname{cosec}\theta)$ is:

SSC CGL 13/09/2024 (Shift-01)

(a) $\sqrt{3}$ (b) $\sqrt{6}$

(c) $\sqrt{2}$ (d) $\sqrt{5}$

227. Simplify $\left[1 - \sin^2 32° + \frac{1}{1 + \tan^2 58°}\right]$.

SSC CGL 19/09/2024 (Shift-02)

(a) $\frac{1}{2}$ (b) sin32°

(c) 1 (d) $\sqrt{3}$

228. The value of $\left(\frac{\sin\theta}{1 + \cos\theta} + \frac{1 + \cos\theta}{\sin\theta}\right)\left(\frac{1}{\tan\theta + \cot\theta}\right)$ is equal to:

SSC CHSL 11/07/2024 (Shift-01)

(a) $\tan\theta$ (b) 1

(c) $2\cos\theta$ (d) $2\sin\theta$

229. Evaluate the given expression.

$$\frac{5}{1 + \cot^2\theta} + \frac{3}{1 + \tan^2\theta} + 2\cos^2\theta$$

SSC CGL 26/09/2024 (Shift-01)

(a) 0 (b) 3

(c) 5 (d) 2

230. The value of $\frac{1 + \sin A}{\cos A} + \frac{\cos A}{1 + \sin A}$ is :

SSC CHSL 14/08/2023 (Shift-01)

(a) 2 sec A (b) 2 cosecA

(c) sec A (d) cosec A

231. What is the value of following in the term of trigonometric ratios?

$$\frac{\sin A}{1+\cos A}+\frac{1+\cos A}{\sin A}$$

SSC CPO 10/11/2022 (Shift-02)

(a) $2\operatorname{cosec} A$ (b) $2\cos A$
(c) $2\sec A$ (d) $2\sin A$

232. Find the value of

$$\frac{\cos A}{1+\sin A}+\frac{1+\sin A}{\cos A}+2$$

SSC CHSL 08/08/2023 (Shift-03)

(a) $1 + 2\sec A$ (b) $2 - \sec A$
(c) $2 + \sec A$ (d) $2(1 + \sec A)$

233. Find the value of $3(\sec^2 A - 1)(\operatorname{cosec} A - 1)(\operatorname{cosec} A + 1) + 4(\operatorname{cosec}^2 A - \cot^2 A)$.

SSC CHSL TIER-II (18/11/2024)

(a) 7 (b) 3
(c) 10 (d) 12

234. If $(1 + \tan^2\theta) + \left[1+\frac{1}{\tan^2\theta}\right] = k$, then $\sqrt{k} = ?$

SSC CGL 06/06/2019 (Shift-03)

(a) $\sec\theta.\operatorname{cosec}\theta$
(b) $\cos\theta.\operatorname{cosec}\theta$
(c) $\sin\theta.\cos\theta$
(d) $\sec\theta.\sin\theta$

235. The value of $\left(\frac{1}{\sin\theta}+\frac{1}{\tan\theta}\right)\left(\frac{1}{\sin\theta}-\frac{1}{\tan\theta}\right)$

SSC CGL 18/07/2023 (Shift-02)

(a) 0 (b) 2
(c) 3 (d) 1

236. $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2$ is equal to ?

SSC CGL TIER-II 07/03/2023

(a) $5 + \tan^2\theta + \cot^2\theta$
(b) $7 + \tan^2\theta - \cot^2\theta$
(c) $7 + \tan^2\theta + \cot^2\theta$
(d) $5 + \tan^2\theta - \cot^2\theta$

237. If $\sin^2\theta\cos^2\theta = \frac{2}{9}$, then what will be the value of $\operatorname{cosec}^2\theta + \sec^2\theta$?

SSC CGL 09/12/2022 (Shift-03)

(a) $\frac{7}{2}$ (b) $\frac{5}{2}$
(c) $\frac{9}{2}$ (d) $9\sqrt{2}$

238. If $\sec\theta - \cos\theta = 14$ and $14\sec\theta = x$, then the value of x is ______.

SSC CHSL 25/05/2022 (Shift-02)

(a) $\tan^2\theta$ (b) $\sec^2\theta$
(c) $2\sec\theta$ (d) $2\tan\theta$

239. Simplify: $\frac{\cos^4\theta - \sin^4\theta}{\sin^2\theta}$

SSC CPO 11/11/2022 (Shift-02)

(a) $1-\tan^2\theta$ (b) $\tan^2\theta-1$
(c) $\cot^2\theta-1$ (d) $1-\cot^2\theta$

240. If $\cos^4\alpha - \sin^4\alpha = \frac{5}{6}$, then the value of $2\cos^2\alpha - 1$ ______.

SSC CPO 11/11/2022 (Shift-03)

(a) $\frac{11}{6}$ (b) $\frac{5}{6}$
(c) $\frac{6}{11}$ (d) $\frac{6}{5}$

241. The given expression is equal to:

$$\frac{(1+\tan^2 A)}{\operatorname{cosec}^2 A.\tan A}$$

SSC CHSL 03/08/2023 (Shift-03)

(a) $\sec^2 A$ (b) $\sec A$
(c) $\tan A$ (d) $\tan^2 A$

242. $\frac{\cos\theta}{\sec\theta-1}+\frac{\cos\theta}{\sec\theta+1}$ is equal to:

SSC CHSL 02/08/2023 (Shift-01)

(a) $2\sec^2\theta$ (b) $2\cot^2\theta$
(c) $2\cos^2\theta$ (d) $2\sin^2\theta$

243. If $\frac{\cos\theta}{(1+\sin\theta)}+\frac{\cos\theta}{(1-\sin\theta)}=4$ and θ is acute, then the value of θ is:

SSC CHSL 03/08/2023 (Shift-01)

(a) 60° (b) 15°
(c) 45° (d) 30°

244. Simplify the expression

$$\frac{3-\sin^2 A+\cos^2 A}{2+2\cos^2 A}$$

SSC CHSL 04/08/2023 (Shift-01)

(a) 1 (b) 0
(c) −1 (d) 2

245. The given expression is equal to:

$$\frac{\sin^4 A+\cos^4 A}{1-2\sin^2 A\cos^2 A}$$

SSC CHSL 09/08/2023 (Shift-02)

(a) 1 (b) −1
(c) 0 (d) 2

246. If $\sin\theta\cos\theta = \frac{1}{\sqrt{3}}$ then the value of $(\sin^4\theta + \cos^4\theta)$ is:

SSC CHSL 17/08/2023 (Shift-03)

(a) 1 (b) $\frac{5}{3}$
(c) $\frac{2}{3}$ (d) $\frac{1}{3}$

247. Simplify the given expression

$$\frac{1+\sin^4\theta+\cos^4\theta}{\cos^2\theta+\sin^4\theta}$$

SSC CGL 24/07/2023 (Shift-04)

(a) 3 (b) 1
(c) 2 (d) 4

248. $\sin^4\theta + \cos^4\theta$ in terms of $\sin\theta$ can be written as:

SSC CGL 03/12/2022 (Shift-02)

(a) $2\sin^4\theta + 2\sin^2\theta - 1$
(b) $2\sin^4\theta - 2\sin^2\theta$
(c) $2\sin^4\theta - 2\sin^2\theta - 1$
(d) $2\sin^4\theta - 2\sin^2\theta + 1$

249. Find the value of the following expression. $2(\tan^2 A\cos^2 A + \cos^2 A)$

SSC CHSL 10/08/2023 (Shift-04)

(a) 4 (b) 1
(c) 3 (d) 2

250. If $\tan\theta = \frac{8}{19}$, find the value of $\sec^2\theta$.

SSC CHSL 02/08/2023 (Shift-03)

(a) $\frac{11}{19}$ (b) $1\frac{8}{19}$
(c) $\frac{297}{361}$ (d) $1\frac{64}{361}$

251. If $\operatorname{cosec}\theta = 1\frac{7}{22}$, find the value of $\cot^2\theta$.

SSC CHSL 03/08/2023 (Shift-04)

(a) $\frac{49}{484}$ (b) $\frac{357}{484}$
(c) $\frac{225}{484}$ (d) $\frac{7}{22}$

252. If $\cot\theta = \frac{9}{17}$, find the value of $\operatorname{cosec}^2\theta$.

SSC CHSL 02/08/2023 (Shift-01)

(a) $1\frac{9}{17}$ (b) $\frac{208}{289}$
(c) $\frac{8}{17}$ (d) $1\frac{81}{289}$

253. Simplify the following.

$\frac{\sin^3 A-\cos^3 A}{\sin A-\cos A}$, where A is an acute angle.

SSC CGL 09/09/2024 (Shift-02)

(a) $1 + \sin A\cos A$ (b) $1 - 3\sin A$
(c) $3\cos A - 1$ (d) $\sin A + \cos A$

254. Simplify: $\frac{\sin^3 A+\cos^3 A}{\sin A+\cos A}$

SSC CPO 28/06/2024 (Shift-03)

(a) $1 - \tan A\sec A$
(b) $1 - \cos A\cot A$
(c) $1 - \sin A\tan A$
(d) $1 - \sin A\cos A$

255. Simplify the given equation.

$\frac{\cot^3 A-1}{\cot A-1} = ?$

SSC CHSL 08/08/2023 (Shift-02)

(a) $\operatorname{cosec}^2 A - \cot A$
(b) $\operatorname{cosec}^2 A + \cot A$
(c) $\cot^2 A + \operatorname{cosec} A$
(d) $\cot^2 A - \operatorname{cosec} A$

256. Simplify the following.

$$\frac{\sin^3\alpha+\cos^3\alpha}{\sin\alpha+\cos\alpha}$$

SSC CGL 14/07/2023 (Shift-04)

(a) $1 + \sin\alpha\cos\alpha$
(b) $\tan\alpha$
(c) $1 - \sin\alpha\cos\alpha$
(d) $\sec\alpha$

257. Solve the following to find its value in terms of trigonometric ratios.

(sin A + cos A) (1 – sin A cosA)

SSC CGL 06/12/2022 (Shift-03)

(a) $\sin^3 A + \cos^3 A$
(b) $\sin^2 A - \cos^2 A$
(c) $[\cos A - \sin A]\,[\sin^2 A + \cos^2 A]$
(d) $\sin^3 A - \cos^3 A$

258. If $\sin^6\theta + \cos^6\theta = \frac{1}{3}$, 0° <θ< 90°, then what is the value of sinθcosθ?

SSC CGL 18/08/2021 (Shift-03)

(a) $\frac{\sqrt{6}}{6}$ (b) $\frac{\sqrt{2}}{3}$
(c) $\frac{\sqrt{2}}{\sqrt{3}}$ (d) $\frac{2}{2}$

259. The value of $\frac{1}{\sin\theta} - \frac{\cot^2\theta}{1+\text{cosec}\,\theta}$ is:

SSC CHSL 07/08/2023 (Shift-04)

(a) 2 (b) 1
(c) –1 (d) 0

260. Simplify the given equation

(1 + tan² A) (1 + cot² A) = ?

SSC CHSL 14/08/2023 (Shift-01)

(a) $\frac{1}{\cos^2 A(1-\sin^2 A)}$
(b) $\frac{1}{\sin^2 A(1-\sin^2 A)}$
(c) $\frac{1}{\sin^2 A + \text{cosec}^2 A}$
(d) $\frac{1}{\sin^2 A(1+\cos^2 A)}$

261. The value of

$\frac{17}{\sec^2\theta} + 10\sin^2\theta + \frac{7}{1+\cot^2\theta}$ is:

SSC CPO 29/06/2024 (Shift-03)

(a) 34 (b) 20
(c) 17 (d) 19

262. Which of the following is NOT a correct formula?

SSC Phase-XII 24/06/2024 (Shift-02)

(a) $\frac{1+\tan^2 A}{\tan^2 A} = \sin^2 A$
(b) secAsinA = tanA
(c) cosec²A – cot²A = 1
(d) cos²Acot²A = cot²A – cos²A

263. Find the value of (tan²θ + tan⁴θ).

SSC CPO 03/10/2023 (Shift-01)

(a) Sec²θ – sec⁴θ
(b) Cot²θ – tan²θ
(c) Sec⁴θ + sec²θ
(d) Sec⁴θ – sec²θ

264. If $\left(\frac{\cos A}{1-\sin A}\right)+\left(\frac{\cos A}{1+\sin A}\right)=4$, then what will be the value of A? (0° < θ < 90°)

SSC CGL 19/07/2023 (Shift-01)

(a) 90° (b) 45°
(c) 60° (d) 30°

265. If 3sin²θ + 5cos²θ = 4 and θ is an acute angle, then the value of tanθ is:

SSC CGL 19/09/2024 (Shift-01)

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{3}}$
(c) $\frac{1}{2}$ (d) 1

266. If $a = x\cos\theta + y\sin\theta$ and $b = x\sin\theta - y\cos\theta$, then $a^2 + b^2$ is equal to:

SSC CGL 17/09/2024 (Shift-02)

(a) $x + y$ (b) $x^2 - y^2$
(c) $x^2 + y^2$ (d) $x - y$

267. (sec ϕ – tan ϕ)² (1 + sin ϕ)² ÷ cos² ϕ = ?

SSC CGL 13/04/2022 (Shift-03)

(a) 1 (b) – 1
(c) cot2 ϕ (d) cos2 ϕ

268. If pcosA = 2qsinA and 2pcosecA – qsecA = 3, then the value of p² + 4q² is:

SSC CGL 10/09/2024 (Shift-02)

(a) 2 (b) 4
(c) 1 (d) 3

269. Let x = r cos (t), y = r sin (t) cos (u), z = r sin (t)sin (u). Then the value of $x^2 + y^2 + z^2$ is ___.

SSC CGL 23/09/2024 (Shift-01)

(a) r² cos (u) (b) r²
(c) 2r (d) r² sin (t)

270. The value of $\frac{1}{\text{cosec}\,\theta - \cot\theta} - \frac{1}{\sin\theta}$ is equal to:

SSC CGL 23/09/2024 (Shift-02)

(a) tanθ (b) cosecθ
(c) cotθ (d) secθ

271. The value of (sin A + cosec A)² + (cosA + secA)² is:

SSC CGL 24/09/2024 (Shift-02)

(a) 3 + tan²A + cot²A
(b) 7 + tan²A + cot²A
(c) 5 + tan²A + cot²A
(d) 1 + tan²A + cot²A

272. Find the value of $\frac{1-\cot^2\theta}{\tan^2\theta - 1}$.

SSC CPO 28/06/2024 (Shift-01)

(a) tanθ (b) cotθ
(c) tan²θ (d) cot²θ

273. If $\left\{\frac{(3\sin\theta - \cos\theta)}{(\cos\theta + \sin\theta)}\right\} = 1$, then the value of cotθ is:

SSC CGL 14/07/2023 (Shift-01)

(a) 3 (b) 0
(c) 1 (d) 2

274. If $\frac{\sin x - \cos x}{\sin x + \cos x} = \frac{2}{5}$, then the value of $\frac{1+\cot^2 x}{1-\cot^2 x}$ is:

SSC CGL 19/07/2023 (Shift-01)

(a) 2.25 (b) 1.45
(c) 3.75 (d) 5.25

275. If (sinθ + cosecθ)² + (cosθ + secθ)² = k + tan²θ + cot²θ, then the value of k is equal to :

SSC CGL TIER-II 18/11/2020

(a) 7 (b) 2
(c) 9 (d) 5

276. If $1 + \sin^2\theta = a\cos^2\theta$, then find $\sec^2\theta + \tan^2\theta$.

SSC Phase-XI 30/06/2023 (Shift-01)

(a) a^{-2} (b) a^{-1}
(c) a (d) a²

277. If m + 5 = sec²Acosec²A(1 – cos²A) (1 – sin²A) + 5, then find the value of m:

SSC CGL 25/09/2024 (Shift-01)

(a) 10 (b) 0
(c) 1 (d) 5

278. If x = p secA cosB, y = q secA sinB and z = r tanA, what is the value of the following expression?

$\frac{x^2}{p^2} + \frac{y^2}{q^2} - \frac{z^2}{r^2}$

SSC CGL 25/09/2024 (Shift-02)

(a) 1 (b) p² + q² – r²
(c) p² – q² + r² (d) 0

279. If x = asecθcosϕ, y = bsecθsinϕ and z = ctanθ, then the value of

$\left(\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}\right)$ is equal to:

SSC CGL 26/09/2024 (Shift-03)

(a) 2 (b) 1
(c) 3 (d) 0

280. If $\tan\theta = \frac{5}{8}$, then find the value of $\frac{(1+\cos\theta)(1-\cos\theta)}{(1+\sin\theta)(1-\sin\theta)}$

SSC CGL 19/09/2024 (Shift-03)

(a) $\frac{5}{64}$ (b) $\frac{2}{25}$
(c) $\frac{25}{64}$ (d) $\frac{64}{25}$

281. $\frac{3\cos^3\theta - 2\cos\theta}{\sin\theta - 3\sin^3\theta}$ is equal to

SSC CHSL 03/07/2024 (Shift-03)

(a) tanθ (b) cot²θ
(c) cotθ (d) tan² θ

282. Simplify the given expression

$\frac{3(\sin^4 z - \cos^4 z + 1)}{\sin^2 z}$

SSC CHSL 11/08/2023 (Shift-04)

(a) 9 (b) 2
(c) 4 (d) 6

283. The value of $\left(\frac{\text{cosec}A}{\text{cosec}A-1} + \frac{\text{cosec}A}{\text{cosec}A+1}\right)\left(\frac{\sec A}{\sec A-1} + \frac{\sec A}{\sec A+1}\right)^{-1}$, when A = 60° is:

SSC CGL 13/09/2024 (Shift-03)

(a) 4 (b) 3
(c) 1 (d) 2

284. If $\tan(t) + \cot(t) = 1$, then one of the values of the expression $\frac{1}{\sin(t) + \cos(t)}$ is ______.

SSC CPO 27/06/2024 (Shift-01)

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{\sqrt{2}}$

(c) $\frac{\sqrt{3}}{2}$ (d) $\sqrt{3}$

285. The value of $(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$ is:

SSC CPO 29/06/2024 (Shift-01)

(a) -3 (b) 3

(c) $\sec\theta\ \text{cosec}\theta$ (d) 1

286. If $\sin\theta + \tan\theta = p$ and $\tan\theta - \sin\theta = q$, then which of the relation satisfies for given values of p and q?

SSC CHSL 11/08/2023 (Shift-04)

(a) $p^2 - q^2 = 4\sqrt{pq}$

(b) $p^2 - q^2 = 8\sqrt{pq}$

(c) $p^2 + q^2 = 4\sqrt{pq}$

(d) $p^2 + q^2 = 4pq$

287. If $P\cos\alpha = 3$ and $4\tan\alpha = Q$, then what is the relation between P and Q, which is independent of α?

SSC CGL 19/07/2023 (Shift-02)

(a) $\frac{9}{P^2} + \frac{16}{Q^2} = 1$ (b) $\frac{9}{P^2} - \frac{16}{Q^2} = 1$

(c) $\frac{P^2}{9} - \frac{Q^2}{16} = 1$ (d) $\frac{P^2}{9} + \frac{Q^2}{16} = 1$

288. If $\cos x + \sin x = \sqrt{2}\cos x$ what is the value of $(\cos x - \sin x)^2 + (\cos x + \sin x)^2$?

SSC CGL 19/07/2023 (Shift-04)

(a) 2 (b) 1

(c) 0 (d) $\frac{1}{\sqrt{2}}$

289. Simplify: $\frac{1 + \sin t}{4 - 4\sin t} - \frac{1 - \sin t}{4 + 4\sin t}$

SSC CGL 21/07/2023 (Shift-04)

(a) 4tant.sint (b) tant.sect

(c) tant − sint (d) tant + sint

290. If $r = 15(\sin\theta + \cos\theta)$ and $s = 16(\sin\theta - \cos\theta)$, then the value of $\frac{r^2}{15^2} + \frac{s^2}{16^2}$ is ______.

SSC CGL 25/07/2023 (Shift-03)

(a) 8 (b) 6

(c) 4 (d) 2

291. If $\sin m + \sin n = p$, $\cos m + \cos n = q$, then find the value of $\sin m \times \sin n + \cos m \times \cos n$.

SSC CHSL 20/03/2023 (Shift-02)

(a) $p^2 - q^2 - 2$ (b) $\frac{(p^2 + q^2 - 2)}{2}$

(c) $p + q - pq$ (d) $p + q + pq$

292. $\frac{(1 + \cos\theta)^2 + \sin^2\theta}{(\text{cosec}^2\theta - 1) \times \sin^2\theta} = ?$

SSC CGL TIER-II 11/09/2019

(a) $\cos\theta(1 + \sin\theta)$

(b) $2\cos\theta(1 + \sec\theta)$

(c) $\sec\theta(1 + \sin\theta)$

(d) $2\sec\theta(1 + \sec\theta)$

293. The value of $\sqrt{\sec^2\theta + \text{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$ is equal to :

SSC CGL 06/06/2019 (Shift-01)

(a) $\text{cosec}\theta.\ \sec^2\theta$

(b) $\sin\theta.\ \sec^2\theta$

(c) $\sin\theta.\ \cos^2\theta$

(d) $\text{cosec}\theta.\ \cos^2\theta$

294. What is the value of $\frac{1}{\sin^4(90^\circ - 2\alpha)} + \frac{1}{\cos^2(90^\circ - 2\alpha) - 1}$

SSC CHSL 04/07/2024 (Shift-02)

(a) $\sin^2 2\alpha \times \tan^2 2\alpha$

(b) $\sec^2 2\alpha \times \tan^2 2\alpha$

(c) $\sec^2 2\alpha \times \cot^2 2\alpha$

(d) $\cos^2 2\alpha \times \cot^2 2\alpha$

295. Simplify: $(1 + \tan^2 A) \times \left(1 + \frac{1}{\tan^2 A}\right)$

SSC CPO 27/06/2024 (Shift-01)

(a) $\frac{1}{\sin^2 A - \sin^4 A}$

(b) $\frac{1}{\sin^2 A - \cos^4 A}$

(c) $\frac{1}{\cos^2 A - \sin^4 A}$

(d) $\frac{1}{\cos^2 A - \tan^4 A}$

296. If A, B and C are the interior angles of ΔABC, then what is the value of ?

$$\left\{\tan\frac{A}{2} + \text{cosec}\frac{B+C}{2}\right\}\left\{\tan\frac{A}{2} - \text{cosec}\frac{B+C}{2}\right\}$$

SSC CPO 28/06/2024 (Shift-03)

(a) 2 (b) -1

(c) -2 (d) 1

297. $\tan^4 A + \tan^2 A$ is equal to:

SSC CPO 29/06/2024 (Shift-01)

(a) $\sec^2 A - \sec^4 A$

(b) $-(\sec^2 A + \sec^4 A)$

(c) $\sec^4 A - \sec^2 A$

(d) $\sec^4 A + \sec^2 A$

298. The value of.....

$$\text{cosec}\theta\left[\frac{1 + \cos\theta}{\sin\theta} + \frac{\sin\theta}{1 + \cos\theta}\right] - 2\cot^2\theta$$

SSC Phase-XII 26/06/2024 (Shift-02)

(a) 0 (b) 1

(c) 3 (d) 2

299. What is value of the expression

$$\sin A\left(1 + \frac{\sin A}{\cos A}\right) + \cos A\left(1 + \frac{\cos A}{\sin A}\right)$$

SSC CHSL 04/08/2023 (Shift-01)

(a) secA + cosecA

(b) sinA + cosA

(c) sinA − cosA

(d) secA − cosecA

• TYPE – V (B) •
BASED ON ALGEBRAIC FORMULAE

300. If $\tan\theta + \cot\theta = 2$ and θ is an acute angle, then the value of θ is:

SSC CGL 19/09/2024 (Shift-03)

(a) 30° (b) 15°

(c) 60° (d) 45°

301. If $\tan A + \cot A = 2$, then the value of $\tan^2 A + \cot^2 A$ is:

SSC CGL 24/09/2024 (Shift-02)

(a) 8 (b) 2

(c) 6 (d) 4

302. If A is an acute angle and $\tan A + \cot A = 2$, find the value of $7\tan^3 A - 6\cot^3 A + 8\sec^2 A$.

SSC CGL 26/09/2024 (Shift-01)

(a) 6 (b) 17

(c) 16 (d) 7

303. If θ is an acute angle and $\tan\theta + \cot\theta = 2$, then find the value of $\tan^2\theta + \cot^3\theta + 6\tan^3\theta\cot^2\theta$.

SSC CHSL 02/07/2024 (Shift-03)

(a) 8 (b) 6

(c) 10 (d) 12

304. If θ is an acute angle and $\cot\theta + \tan\theta = 2$, then find the value of $\tan^{12}\theta + \cot^{12}\theta + 2\tan^5\theta\cot^7\theta$.

SSC CHSL 04/07/2024 (Shift-03)

(a) 2 (b) 3

(c) 4 (d) 1

305. If $\tan\theta + \cot\theta = 2$, then find the value of $\tan^{53}\theta + \cot^{38}\theta$.

SSC Phase-XII 20/06/2024 (Shift-03)

(a) -1 (b) 2

(c) 0 (d) 1

306. If θ is an angle and $\sin\theta + \text{cosec}\theta = 2$, then the value of $\sin^5\theta + \text{cosec}^5\theta$ is:

SSC CPO 03/10/2023 (Shift-01)

(a) 2 (b) 10

(c) 4 (d) 5

307. If $\cos\theta + \sec\theta = 2$, then the value of $\sin^6\theta + \cos^6\theta$ is:

SSC CPO 10/11/2022 (Shift-03)

(a) $\frac{1}{3}$ (b) 0

(c) 1 (d) $\frac{1}{2}$

308. If $\tan\theta + \cot\theta = 6$, then the value of $\tan^2\theta + \cot^2\theta$ is ____ .

SSC CPO 28/06/2024 (Shift-02)

(a) 24 (b) 34

(c) 20 (d) 22

309. If $\sin\theta + \text{cosec}\theta = \sqrt{5}$, then the value of $\sin^3\theta + \text{cosec}^3\theta$ is:

SSC Phase-XII 26/06/2024 (Shift-03)

(a) $\sqrt{5}$ (b) 0

(c) $\frac{1}{\sqrt{5}}$ (d) $2\sqrt{5}$

310. If $\cos\theta+\sec\theta=\sqrt{3}$, then the value of $\cos^3\theta+\sec^3\theta$ is:

SSC CHSL 02/08/2023 (Shift-03)

(a) 0 (b) $\frac{1}{\sqrt{3}}$
(c) $\sqrt{3}$ (d) $2\sqrt{3}$

311. If $\sec\theta+\cos\theta=32$, then $\sec^2\theta+\cos^2\theta$ is ____.

SSC CGL 14/07/2023 (Shift-04)

(a) 1000 (b) 1022
(c) 1024 (d) 1020

312. If $3x=\sec A$ and $\frac{3}{x}=\tan A$ then $9\left(x^2-\frac{1}{x^2}\right)$ is ____.

SSC CGL 27/07/2023 (Shift-02)

(a) 3 (b) 9
(c) 1 (d) $\frac{1}{9}$

313. If $\sin\theta-\operatorname{cosec}\theta=6$, then what is the value of $\sin\theta+\operatorname{cosec}\theta$?

SSC CHSL 14/03/2023 (Shift-02)

(a) 6 (b) $\sqrt{40}$
(c) $\sqrt{34}$ (d) $\sqrt{38}$

314. If $\sec x-\cos x=4$, then what will be the value of $\frac{(1+\cos^2x)}{\cos x}$?

SSC CGL 08/12/2022 (Shift-03)

(a) $\frac{9}{4}$ (b) $\frac{1}{4}$
(c) $2\sqrt{5}$ (d) $\sqrt{5}$

315. The value of the expression $\sin x+\operatorname{cosec}x=2$, then the value of $\sin^7x+\operatorname{cosec}^7x$ is:

SSC CGL 19/09/2024 (Shift-01)

(a) 0 (b) 1
(c) 2 (d) 4

• TYPE – V (C) •

If $\sec\theta+\tan\theta=K$, Then
$\sec\theta-\tan\theta=1/K$,
If $\operatorname{cosec}\theta-\cot\theta=K$, Then
$\operatorname{cosec}\theta+\cot\theta=1/K$

316. If $\sec\theta+\tan\theta=x$, then find $\sin\theta$.

SSC CGL 25/09/2024 (Shift-03)

(a) $\frac{x^2+1}{1-x^2}$ (b) $\frac{x^2-1}{1+2x^2}$
(c) $\frac{x^2-1}{1+x^2}$ (d) $\frac{1-x^2}{1+x^2}$

317. If $\tan A+\sec A=K$, then what is the value of $\sin A$.

SSC CHSL 10/03/2023 (Shift-01)

(a) $\frac{2K}{K^2+1}$ (b) $\frac{K^2-1}{2K}$
(c) $\frac{K^2+1}{K^2-1}$ (d) $\frac{K^2-1}{K^2+1}$

318. If $\sec A-\tan A=p$, then find the value of $\sec A$.

SSC CPO 04/10/2023 (Shift-02)

(a) $\frac{p^2-1}{p^2+1}$ (b) $\frac{p^2+1}{p^2-1}$
(c) $\frac{p^2+1}{2p}$ (d) $\frac{p^2+1}{p}$

319. If $\tan\theta+\sec\theta=a$, then what is $\sec\theta$?

SSC Phase-XI 28/06/2023 (Shift-03)

(a) $\frac{a-1}{2a}$ (b) $\frac{a^2+1}{2a}$
(c) $\frac{1}{2a}$ (d) $\frac{a^2-1}{2a}$

320. If $\sec\theta+\tan\theta=5$, $(\theta\neq 0)$ then $\sec\theta$ is equal to:

SSC CGL 14/07/2023 (Shift-04)

(a) $\left(5+\frac{1}{5}\right)$ (b) $\frac{1}{2}\left(3+\frac{1}{3}\right)$
(c) $\frac{1}{2}\left(5+\frac{1}{5}\right)$ (d) $\left(3+\frac{1}{3}\right)$

321. If $\sec\theta+\tan\theta=5$, then $\sin\theta$?

SSC CHSL 11/08/2023 (Shift-02)

(a) 0 (b) $\frac{12}{13}$
(c) $\frac{13}{12}$ (d) $\frac{1}{5}$

322. If $\sec\theta+\tan\theta=5$, then what is the value of $\sec\theta-\tan\theta$?

SSC CHSL 09/03/2023 (Shift-01)

(a) $\frac{1}{5}$ (b) $\frac{1}{3}$
(c) $\frac{1}{6}$ (d) $\frac{1}{2}$

323. If $\sec\theta-\tan\theta=m$, then $2\tan\theta=$?

SSC CHSL 02/08/2023 (Shift-03)

(a) $\frac{1-m}{m}$ (b) $\frac{1-m^2}{m}$
(c) $\frac{1+m^2}{m}$ (d) $\frac{m^2+1}{m}$

324. If $\sec\theta\tan{=}\theta 3\sqrt{}$then find the positive value of $\sin\theta+\cos\theta$.

SSC CHSL 04/08/2023 (Shift-03)

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{2}{\sqrt{3}}$
(c) $\frac{2}{(1+\sqrt{3})}$ (d) $\frac{(1+\sqrt{3})}{2}$

325. If $\sec^2\theta+\tan^2\theta=\frac{25}{18}$, then the value of $\sec^4\theta-\tan^4\theta$ is:

SSC CGL 14/07/2023 (Shift-03)

(a) $\frac{18}{25}$ (b) $\frac{25}{12}$
(c) $\frac{25}{9}$ (d) $\frac{25}{18}$

326. If $\operatorname{cosec}\theta+\cot\theta=\frac{3}{2}$, then what is the value of $\operatorname{cosec}\theta$?

SSC CGL 24/07/2023 (Shift-03)

(a) $\frac{13}{12}$ (b) $\frac{3}{2}$
(c) $\frac{11}{12}$ (d) $\frac{9}{13}$

327. If the value of $\operatorname{cosec}A+\cot A=m$, then the value of $\operatorname{cosec}A-\cot A$ is:

SSC CPO 10/11/2022 (Shift-02)

(a) $\frac{1}{m}$ (b) m
(c) $\sqrt{m}$ (d) m^2

328. If $\operatorname{cosec}\theta+\cot\theta=m$, find the value of $\frac{m^2-1}{m^2+1}$.

SSC CGL 24/07/2023 (Shift-02)

(a) 1.1 (b) 2.0
(c) $\cos\theta$ (d) $-\sin\theta$

329. If $\operatorname{cosec}A+\cot A=a\sqrt{b}$, then find the value of $\frac{(a^2b-1)}{(a^2b+1)}$.

SSC CHSL 17/08/2023 (Shift-02)

(a) $\cos A$ (b) $\tan A$
(c) $\frac{1}{\sin A}$ (d) $\frac{1}{\cot A}$

330. If $\sec x+\tan x=5$ and $\operatorname{cosec}y-\cot y=\frac{1}{3}$, then find the value of $(\sec x+\operatorname{cosec}y)-(\tan x-\cot y)$.

SSC CHSL 15/03/2023 (Shift-01)

(a) 2.2 (b) 3.2
(c) 4.2 (d) 3.1

• TYPE – V (D) •
BASED ON QUADRATIC EQUATIONS

331. If $2\sin^2\theta+3\sin\theta-2=0$, $(0<q<90°)$ then the value of θ is:

SSC CGL 24/09/2024 (Shift-01)

(a) 15° (b) 30°
(c) 60° (d) 45°

332. If $\tan^2A+2\tan A-63=0$ Given that $0<A<\frac{\pi}{4}$ what is the value of $(2\sin A+5\cos A)$?

SSC CGL 11/04/2022 (Shift-03)

(a) $19\sqrt{50}$ (b) $15\sqrt{50}$
(c) $\frac{19}{\sqrt{50}}$ (d) $\frac{15}{\sqrt{50}}$

333. If $10\sin^2\theta + 6\cos^2\theta = 7, 0 < \theta < 90°$, then find the value of $\tan\theta$.

SSC CGL 24/09/2024 (Shift-03)

(a) $\sqrt{3}$ (b) 1

(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{2}$

334. $12\sin^2A + 2\cos^2A = 7$, Where $0 < A < 180°$. Then cot A is:

SSC CHSL 01/07/2024 (Shift-04)

(a) ± 1 (b) $\pm\frac{1}{2}$

(c) $\pm\frac{1}{\sqrt{2}}$ (d) $\pm\frac{1}{\sqrt{3}}$

335. If $4\sin^2\theta - 4\sqrt{3}\sin\theta + 3 = 0$, then find the value of θ. $(0 < \theta < 90°)$

SSC CHSL 10/07/2024 (Shift-03)

(a) 30° (b) 75°

(c) 60° (d) 45°

336. Solve the equation for A (in degrees). $2\cos^2A + 3\cos A - 2 = 0, 0 < A < 90°$

SSC CPO 28/06/2024 (Shift-01)

(a) 30° (b) 80°

(c) 60° (d) 45°

337. If $4\sin^2\theta = 3(1 + \cos\theta), 0° < \theta < 90°$, then what is the value of $\sqrt{15}\tan\theta + \frac{4}{\sqrt{15}}\sin\theta + 2\sec\theta$?

SSC CPO 28/06/2024 (Shift-02)

(a) 24 (b) $4\sqrt{15}$

(c) $\frac{8}{\sqrt{15}}$ (d) 8

338. If $3\sec^4\theta + 8 = 10\sec^2\theta$, then the value of $\tan\theta$ can be:

SSC Phase-XII 26/06/2024 (Shift-04)

(a) $1, \frac{1}{\sqrt{3}}$ (b) $1, \sqrt{3}$

(c) $2, \frac{1}{\sqrt{3}}$ (d) $2, \sqrt{3}$

339. If $7\sin^2A + 3\cos^2A = 4$, then find cot A:

SSC CPO 04/10/2023 (Shift-02)

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{\sqrt{2}}$

(c) $\sqrt{3}$ (d) $\sqrt{2}$

340. If $2\text{cosec}^2\theta + 3\cot^2\theta = 17$, then the value of 'θ' when $0° \le \theta \le 90°$ is:

SSC CGL 12/09/2024 (Shift-01)

(a) 45° (b) 90°

(c) 30° (d) 75°

341. If $\sec^2\alpha + 4\cos^2\alpha = 4$ and $0° \le \alpha \le 90°$, then find the value of α.

SSC CGL 21/04/2022 (Shift-03)

(a) 30° (b) 60°

(c) 0° (d) 45°

342. If $7\cos^2\theta + 5\sin^2\theta - 6 = 0, (0° < \theta < 90°)$, then what is the value of $1 + \sqrt{\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}}$?

SSC CGL 10/09/2024 (Shift-03)

(a) $\sqrt{2} + 2$ (b) $\sqrt{2} + 1$

(c) $\sqrt{2} - 1$ (d) $\sqrt{2} - 2$

343. If $\sqrt{2}\sec^2\theta - 4\sec\theta + 2\sqrt{2} = 0$, then what is the value of $\sin^2\theta + \tan^2\theta$?

SSC CHSL 14/03/2023 (Shift-03)

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$

(c) $\frac{5}{2}$ (d) $\frac{3}{2}$

344. If $\sin^2\theta - \cos^2\theta - 3\sin\theta + 2 = 0, 0° < \theta < 90°$, Then what is the value of $1 + \sec\theta + \tan\theta$?

SSC CGL 13/04/2022 (Shift-03)

(a) $-1-\sqrt{3}$ (b) $-1+\sqrt{3}$

(c) $1+\sqrt{3}$ (d) $1-\sqrt{3}$

345. If $6\cos^2\theta + \cos\theta = 2, 0° < \theta < 90°$ then the value of $(\text{cosec}\theta + \cot\theta + \tan\theta)$ is

SSC PHASE-IX 2022

(a) $2\sqrt{3}$ (b) $4\sqrt{3}$

(c) $3\sqrt{3}$ (d) $6\sqrt{3}$

346. If $8\cos^2\theta - 2\cos\theta - 3 = 0, 0° < \theta < 90°$, then what is the value of $3\tan\theta + \text{cosec}\theta + \cot\theta$?

SSC PHASE-IX 2022

(a) $\frac{3}{4}\sqrt{7}$ (b) $4\sqrt{7}$

(c) $2\sqrt{7}$ (d) $\frac{4}{3}\sqrt{7}$

347. If $7\sin^2\theta + 4\cos^2\theta = 5$ and θ lies in the first quadrant, then what is the value of $\frac{\sqrt{3}\sec\theta + \tan\theta}{\sqrt{2}\cot\theta - \sqrt{3}\cos\theta}$?

SSC CGL TIER-II 29/01/2022

(a) $2(1+\sqrt{2})$ (b) $3\sqrt{2}$

(c) $2(\sqrt{2}-1)$ (d) $4\sqrt{2}$

348. If $\sin^2\theta - \cos^2\theta - 3\sin\theta + 2 = 0, 0° < \theta < 90°$, then what is the value of $\frac{1}{\sqrt{\sec\theta - \tan\theta}}$ is:

SSC CGL 23/08/2021 (Shift-01)

(a) $\sqrt[4]{3}$ (b) $\sqrt[3]{2}$

(c) $\sqrt[3]{3}$ (d) $\sqrt[4]{2}$

349. Find the value of θ, if $\sec^2\theta + (1-\sqrt{3})\tan\theta - (1+\sqrt{3}) = 0$, where θ is an acute angle.

SSC CHSL 05/08/2021 (Shift-03)

(a) 30° (b) 15°

(c) 45° (d) 60°

350. If $4 - 2\sin^2\theta - 5\cos\theta = 0, 0° < \theta < 90°$, then the value of $\cos\theta + \tan\theta$ is:

SSC CPO 23/11/2020 (Shift-01)

(a) $\frac{2+\sqrt{3}}{2}$ (b) $\frac{2-\sqrt{3}}{2}$

(c) $\frac{1+2\sqrt{3}}{2}$ (d) $\frac{1-2\sqrt{3}}{2}$

351. If $\frac{\sin^2\theta - 3\sin\theta + 2}{\cos^2\theta} = 1$, where $0° < \theta < 90°$, then what is the value of $(\cos 2\theta - \sin 3\theta + \text{cosec}2\theta)$

SSC CGL 21/04/2022 (Shift-02)

(a) $\frac{3+4\sqrt{3}}{6}$ (b) $\frac{-3-4\sqrt{3}}{6}$

(c) $\frac{3-4\sqrt{3}}{6}$ (d) $\frac{-3+4\sqrt{3}}{6}$

352. If $\frac{\sin^2\theta}{\cos^2\theta - 3\cos\theta + 2} = 1$, θ lies in the first quadrant, then the value of $\frac{\tan^2\frac{\theta}{2} + \sin^2\frac{\theta}{2}}{\tan\theta + \sin\theta}$ is:

SSC CGL TIER-II 03/02/2022

(a) $\frac{2\sqrt{3}}{27}$ (b) $\frac{5\sqrt{3}}{27}$

(c) $\frac{2\sqrt{3}}{9}$ (d) $\frac{7\sqrt{3}}{54}$

353. If θ is an acute angle and $\sin\theta\cos\theta = 2\cos^3\theta - \frac{1}{4}\cos\theta$, then the value of $\sin\theta$ is:

SSC CHSL 10/08/2023 (Shift-02)

(a) $\frac{\sqrt{15}-1}{8}$ (b) $\frac{\sqrt{15}-1}{4}$

(c) $\frac{\sqrt{15}+1}{4}$ (d) $\frac{\sqrt{15}-1}{2}$

◆ TYPE – V (E) ◆
TRIGONOMETRIC IDENTITIES (ADVANCE QUESTIONS.)

354. $[(\sin\theta\tan\theta + \cos\theta)^2 - 1]$ is equal to:

SSC Phase-X 02/08/2022 (Shift-02)

(a) $\sec^2\theta$ (b) $\sec\theta$

(c) $\text{cosec}\,\theta$ (d) $\tan^2\theta$

355. Find the value of $(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$.

SSC CGL 25/09/2024 (Shift-01)

(a) 0 (b) $\frac{1}{2}$

(c) 1 (d) −1

356. The expression $(\tan\theta + \cot\theta)(\sec\theta + \tan\theta)(1 - \sin\theta), 0° < A < 90°$, is equal to:

SSC CGL TIER-II 03/02/2022

(a) $\sec\theta$ (b) $\text{cosec}\theta$

(c) $\cot\theta$ (d) $\sin\theta$

357. Find the value of $(\sin^6A + \cos^6A + 3\sin^2A\cos^2A) - (\sin^4A - \cos^4A + 1)\text{cosec}^2A$.

SSC CHSL TIER-II (18/11/2024)

(a) 3 (b) 0

(c) −3 (d) −1

358. The value of the expression $4(\sin^6 A + \cos^6 A) - 6(\sin^4 A + \cos^4 A) + 8$ is:

SSC CHSL 02/08/2023 (Shift-04)

(a) 4 (b) 8

(c) 7 (d) 6

359. Find the value of the following expression.

$12(\sin^4\theta + \cos^4\theta) + 18(\sin^6\theta + \cos^6\theta) + 78\sin^2\theta\cos^2\theta$

SSC CGL 18/07/2023 (Shift-03)

(a) 30 (b) 40

(c) 10 (d) 20

360. Find the value of the following expression $5(\sin^4\theta + \cos^4\theta) + 3(\sin^6\theta + \cos^6\theta) + 19\sin^2\theta\cos^2\theta$.

SSC CGL 07/12/2022 (Shift-03)

(a) 8 (b) 5

(c) 6 (d) 7

361. The expression $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3$ is equal to:

SSC CGL 13/04/2022 (Shift-02)

(a) 0 (b) – 1

(c) 2 (d) 1

362. If $p\sin A - \cos A = 1$, then $p^2 - (1 + p^2)\cos A$ is equal to:

SSC CGL 11/09/2024 (Shift-03)

(a) 1 (b) –1

(c) 2 (d) 0

363. If $\sin A + \cos A = \frac{1}{2\sqrt{2}}$, then find the value of $\sin^4 A + \cos^4 A$.

SSC CGL 17/09/2024 (Shift-02)

(a) $\frac{79}{128}$ (b) $\frac{7}{13}$

(c) $\frac{79}{126}$ (d) $\frac{5}{13}$

364. If $\sin A + \cos A = \sqrt{3}$, then find the value of $\tan A + \cot A + 2\sin A\cos A$.

SSC CGL 19/09/2024 (Shift-01)

(a) 6 (b) 2

(c) 1 (d) 3

365. If $\sin A + \cos A = \frac{4}{3}$, then find the value of $\tan A + \cot A$.

SSC Phase-XII 20/06/2024 (Shift-03)

(a) $\frac{4}{3}$ (b) $\frac{3}{4}$

(c) $\frac{18}{7}$ (d) $\frac{7}{18}$

366. If $\sin A - \cos A = \frac{\sqrt{3}-\sqrt{2}}{2}$ then the value of $\sin A \,.\cos A$ is:

SSC CGL 23/09/2024 (Shift-02)

(a) $\frac{2\sqrt{3}-1}{4}$ (b) $\frac{2\sqrt{2}-1}{8}$

(c) $\frac{2\sqrt{6}-1}{8}$ (d) $\frac{3\sqrt{2}-1}{4}$

367. If $\sin\alpha + \cos\alpha = \frac{2}{\sqrt{3}}$, then what is $(\tan\alpha + \cot\alpha)$ equal to?

SSC CHSL 03/08/2023 (Shift-01)

(a) 1 (b) 2

(c) 6 (d) 0

368. If $\sin\theta + \cos\theta = \frac{\sqrt{11}}{3}$, then what is $\tan\theta + \cot\theta$ equal to?

SSC Phase-XI 27/06/2023 (Shift-04)

(a) 5 (b) 9

(c) 7 (d) 11

369. If $\sin\theta + \cos\theta = \frac{\sqrt{3}-1}{2\sqrt{2}}$, then what is the value of $\tan\theta + \cot\theta$?

SSC CGL 05/12/2022 (Shift-01)

(a) $8(\sqrt{3} - 2)$ (b) $12(\sqrt{3} - 2)$

(c) $12(\sqrt{3} + 2)$ (d) $8(\sqrt{3} + 2)$

370. If $\sin t + \cos t = \frac{4}{5}$, then find $\sin t.\cos t$.

SSC CGL 17/07/2023 (Shift-01)

(a) $\frac{9}{50}$ (b) $\frac{-9}{50}$

(c) $\frac{9}{25}$ (d) $\frac{-9}{25}$

371. If $f(p) = \sin^{p+2}x + \cos^{p+2}x$, then the value of $6f(2) - 4f(4) + 10f(0)$

SSC CHSL 10/07/2024 (Shift-02)

(a) 14 (b) 10

(c) 12 (d) 11

372. If $\tan A + \sin A = x$, $\tan A - \sin A = y$, what is the value of $x^2 - y^2$?

SSC CHSL 11/07/2024 (Shift-04)

(a) $2\sqrt{\frac{x}{y}}$ (b) $4\sqrt{\frac{x}{y}}$

(c) $\sqrt{xy}$ (d) $4\sqrt{xy}$

373. If $(\sin x + \sin y) = a$ and $(\cos x + \cos y) = b$, then find the value of $(\sin x \sin y + \cos x \cos y)$.

SSC CPO 27/06/2024 (Shift-02)

(a) $\frac{a^2 + b^2 - 1}{2}$ (b) $\frac{a^2 + b^2 - 1}{2}$

(c) $\frac{a^2 + b^2 - 2}{2}$ (d) $\frac{a^2 + b^2 + 2}{2}$

374. If $\cot^2\theta = 1 - e^2$, then the value of $\text{cosec}\,\theta + \cot^3\theta\sec\theta$ is:

SSC CPO 05/10/2023 (Shift-03)

(a) $(2 - e^2)^{\frac{3}{2}}$ (b) $(1 - e^2)$

(c) $(1 - e^2)^{\frac{3}{2}}$ (d) $(2 - e^2)^{\frac{1}{2}}$

375. If $\tan^2\theta = 1 - a^2$, then the value of $\sec\theta + \tan^3\theta\,\text{cosec}\,\theta$ is:

SSC CGL 01/12/2022 (Shift-04)

(a) $(2 - a)^{\frac{3}{2}}$ (b) $(a^2 - 1)^{\frac{3}{2}}$

(c) $(2 - a^2)^{\frac{3}{2}}$ (d) $a^{\frac{3}{2}}$

376. If $\tan^2\alpha = 3 + Q^2$, then $\sec\alpha + \tan^3\alpha\,\text{cosec}\,\alpha = ?$

SSC CGL 07/12/2022 (Shift-01)

(a) $(3 + Q^2)^{\frac{1}{2}}$ (b) $(7 + Q^2)^{\frac{3}{2}}$

(c) $(5 - Q^2)^{\frac{3}{2}}$ (d) $(4 + Q^2)^{\frac{3}{2}}$

377. Let $0° < \theta < 90°$, $(1 + \cot^2\theta)(1 + \tan^2\theta) \times (\sin\theta - \text{cosec}\,\theta)(\cos\theta - \sec\theta)$ is equal to:

SSC CGL TIER-II 29/01/2022

(a) $\sec\theta\,\text{cosec}\,\theta$ (b) $\sec\theta + \text{cosec}\,\theta$

(c) $\sin\theta + \cos\theta$ (d) $\sin\theta\cos\theta$

378. If $x\sin^3\theta + y\cos^3\theta = \sin\theta.\cos\theta$ and $x\sin\theta = y\cos\theta$ then the value of $x^2 + y^2$ is:

SSC CHSL 20/10/2020 (Shift-01)

(a) 0 (b) 4

(c) 1 (d) 2

379. If $a\sin^3 X + b\cos^3 X = \sin X\cos X$ and $a\sin X = b\cos X$, then find the value of $a^2 + b^2$, provided that X is neither 0° nor 90°.

SSC CGL 11/09/2024 (Shift-01)

(a) 0 (b) 1

(c) $a^2 - b^2$ (d) $a^2 + b^2$

380. The value of

$$\left(\frac{\sin A}{1-\cos A} + \frac{1-\cos A}{\sin A}\right) \div \left(\frac{\cot^2 A}{1+\text{cosec}A} + 1\right)$$ is:

SSC CGL TIER-II 12/09/2019

(a) $\frac{3}{2}$ (b) $\frac{1}{2}$

(c) 1 (d) 2

381. The value of

$$\frac{\sec^2\theta(2+\tan^2\theta+\cot^2\theta)+(\sin^2\theta-\tan^2\theta)}{(\text{cosec}^2\theta+\sec^2\theta)(1+\cot^2\theta)^2}$$ is:

SSC CGL TIER-II 15/10/2020

(a) –1 (b) 1

(c) – 2 (d) 2

382. $\frac{2 + \tan^2 2A + \cot^2 2A}{\sec 2A.\ \text{cosec}2A}$ is equal to

SSC CGL 10/09/2024 (Shift-01)

(a) $\sec 2A + \tan 2A$

(b) $\sec 2A + \text{cosec}2A$

(c) $\cot 2A - \text{cosec}2A$

(d) $\sec 2A\ \text{cosec}2A$

383. The value of

$$\left(\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}\right)^3 \frac{1}{\tan\theta} - \sec^2\theta$$ is:

SSC CGL 12/09/2024 (Shift-01)

(a) 2 (b) 1

(c) 0 (d) –1

384. The value of

$$\frac{\sin A}{\cot A + \text{cosec}\ A} - \frac{\sin A}{\cot A - \text{cosec}\ A} - 1$$

SSC CPO 11/11/2022 (Shift-02)

(a) $\frac{1}{2}$ (b) 1

(c) 0 (d) 2

385. $\left(\frac{\tan^3\theta}{\sec^2\theta}+\frac{\cot^3\theta}{\operatorname{cosec}^2\theta}+2\sin\theta\cos\theta\right) \div (1 + \operatorname{cosec}^2\theta + \tan^2\theta)$, $0° < \theta < 90°$ is equal to:

SSC CGL TIER-II 29/01/2022

(a) $\sin\theta\cos\theta$ (b) $\operatorname{cosec}\theta$
(c) $\sec\theta$ (d) $\operatorname{cosec}\theta\sec\theta$

386. $\frac{(1+\sec\theta\operatorname{cosec}\theta)^2(\sec\theta-\tan\theta)^2(1+\sin\theta)}{(\sin\theta+\sec\theta)^2+(\cos\theta+\operatorname{cosec}\theta)^2}$, $0°, < \theta < 90°$, is equal to:

SSC CGL TIER-II 29/01/2022

(a) $1 - \cos\theta$ (b) $1 - \sin\theta$
(c) $\cos\theta$ (d) $\sin\theta$

387. $\frac{\cot^3\theta}{\operatorname{cosec}^2\theta}+\frac{\tan^3\theta}{\sec^2\theta}+2\sin\theta\cos\theta = ?$

SSC CGL 16/08/2021 (Shift-02)

(a) $\operatorname{cosec}\theta\sec\theta$ (b) $\operatorname{cosec}^2\theta\sec^2\theta$
(c) $\sin\theta\cos\theta$ (d) $\sin\theta$

388. $\left(\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}\right)\left(\frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-\sin^2\theta}\right)$, $0° < \theta < 90°$ is equal to:

SSC CGL 17/08/2021 (Shift-01)

(a) $\cot\theta$ (b) $\operatorname{cosec}^2\theta$
(c) $\sec^2\theta$ (d) $\tan\theta$

389. $\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$ is equal to :

SSC CGL TIER-II 11/09/2019

(a) $1 + \sin A - \cos A$
(b) $1 - \sin A.\cos A$
(c) $1 + \cos A - \sin A$
(d) $1 + \sin A.\cos A$

390. The value of

$\frac{\sin\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$ is:

SSC CGL TIER-II 12/09/2019

(a) $2\cos\phi$ (b) $\operatorname{cosec}\phi.\sec\phi$
(c) $2\sin\phi$ (d) $\sin^2\phi.\cos^2\phi$

391. $\frac{1+\cos\theta-\sin^2\theta}{\sin\theta(1+\cos\theta)} \times \frac{\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}}{\tan\theta+\cot\theta}$, $0° < \theta < 90°$

SSC CGL TIER-II 29/01/2022

(a) $\tan\theta$ (b) $\sec\theta$
(c) $\operatorname{cosec}\theta$ (d) $\cot\theta$

392. The expression

$$\frac{\tan^6\theta-\sec^6\theta+3\sec^2\theta\tan^2\theta}{\tan^2\theta+\cot^2\theta+2}$$

$0° < \theta < 90°$, is equal to:

SSC CGL TIER-II 03/02/2022

(a) $\sec^2\theta\operatorname{cosec}^2\theta$ (b) $-\sec^2\theta\operatorname{cosec}^2\theta$
(c) $\cos^2\theta\sin^2\theta$ (d) $-\cos^2\theta\sin^2\theta$

393. The value of

$\frac{\sec^6\theta-\tan^6\theta-3\sec^2\theta\tan^2\theta+1}{\cos^4\theta-\sin^4\theta+2\sin^2\theta+2}$ is:

SSC CGL 05/03/2020 (Shift-01)

(a) $\frac{2}{3}$ (b) 1
(c) $\frac{3}{4}$ (d) $\frac{1}{2}$

394. The expression

$$\frac{\cos^4\theta-\sin^4\theta+2\sin^2\theta+3}{(\operatorname{cosec}\theta+\cot\theta+1)(\operatorname{cosec}\theta-\cot\theta+1)-2}$$

$0° < \theta < 90°$, is equal to

SSC CGL TIER-II 03/02/2022

(a) $\frac{1}{2}\sin\theta$ (b) $2\sin\theta$
(c) $\sec\theta$ (d) $2\operatorname{cosec}\theta$

395. The expression

$$\frac{(1-\sin\theta+\cos\theta)^2(1-\cos\theta)\sec^3\theta\operatorname{cosec}^2\theta}{(\sec\theta-\tan\theta)(\tan\theta+\cot\theta)},$$

$0° < \theta < 90°$, is equal to

SSC CGL TIER-II 03/02/2022

(a) $\sin\theta$ (b) $2\cos\theta$
(c) $\cot\theta$ (d) $2\tan\theta$

396. The expression

$$\frac{(1-2\sin^2\theta\cos^2\theta)(\cot\theta+1)\cos\theta}{(\sin^4\theta+\cos^4\theta)(1+\tan\theta)\operatorname{cosec}\theta}-1,$$

$0° < \theta < 90°$, is equal to:

SSC CGL TIER-II 03/02/2022

(a) $\cos^2\theta$ (b) $-\sin^2\theta$
(c) $\sec^2\theta$ (d) $-\sec^2\theta$

◆ TYPE – V (F) ◆
BAHUBALI CONCEPT

397. If $\cot^4\theta - \cot^2\theta = 1$, then the value of $\cos^4\theta + \cos^2\theta$ is:

SSC CGL 12/09/2024 (Shift-02)

(a) 2 (b) 1
(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{3}{2}$

398. If $\cot^4 A + \cot^2 A = 1$ then find the value of $\cos^4 A - 3\cos^2 A$.

SSC CHSL TIER-II 02/11/2023

(a) 2 (b) −1
(c) 1 (d) −2

399. If $\sin A + \sin^2 A = 1$, then the value of $\cos^4 A + \cos^6 A$ is:

SSC CPO 04/10/2023 (Shift-01)

(a) 1 (b) $\cos A$
(c) $\sin A$ (d) 0

400. If $\sin A + \sin^2 A = 1$, then the value of the expression $(\cos^2 A + \cos^4 A)$ is ....

SSC CHSL 02/08/2023 (Shift-01)

(a) $\frac{3}{2}$ (b) 1
(c) 2 (d) $\frac{1}{2}$

401. If $\sin x + \sin^2 x = 1$, then what is the value of $\cos^8 x + 2\cos^6 x + \cos^4 x$?

SSC CHSL TIER-II 26/06/2023

(a) 1 (b) 0
(c) 4 (d) 2

402. If $\sin^4 x + \sin^2 x = 1$, then what is the value of $\cot^4 x + \cot^2 x$?

SSC CHSL 17/03/2023 (Shift-02)

(a) − 2 (b) 2
(c) − 1 (d) 1

403. If $\cos A + \cos^2 A = 1$ then $\sin^2 A + \sin^4 A$ is equal to:

SSC CGL 23/09/2024 (Shift-02)

(a) $\frac{\cos^2 A}{\cos A}$ (b) 0
(c) $\frac{\cos A}{\cos^2 A}$ (d) 1

404. If $\cos A + \cos^2 A = 1$, then the value of $\sin^4 A + \sin^6 A$ is:

SSC CGL 26/07/2023 (Shift-01)

(a) 2 (b) $\cos A$
(c) 1 (d) $\sin A$

405. If $\tan^4\theta + \tan^2\theta = 1$, what is the value of $11(\cos^4\theta + \cos^2\theta)$?

SSC CGL 27/07/2023 (Shift-03)

(a) −11 (b) 8
(c) 0 (d) 11

406. If $\cos A = \sin^2 A$, and $a\sin^{12} A + b\sin^{10} A + c\sin^8 A + \sin^6 A = 1$, then $a + b + c = ?$

SSC CPO 11/11/2022 (Shift-01)

(a) 7 (b) 8
(c) 9 (d) 6

407. If $\sin^2\theta = \cos^3\theta$, then the value of $\cot^2\theta - \cot^6\theta$ is:

SSC CPO 11/11/2022 (Shift-02)

(a) −1 (b) 0
(c) 2 (d) 1

◆ TYPE – V (G) ◆
SOME SPECIAL CONCEPTS

408. Find the value of the following expression.

$$\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$$

SSC CGL 05/12/2022 (Shift-04)

(a) $\sec\theta + \tan\theta$
(b) $\operatorname{cosec}\theta + \tan\theta$
(c) $\operatorname{cosec}\theta + \cot\theta$
(d) $\sec\theta + \cot\theta$

409. What is $\frac{\sqrt{1-\sin A}}{\sqrt{1+\sin A}}$?

SSC CHSL 09/03/2023 (Shift-02)

(a) $\sec^2 A$ (b) $\sec A + \tan A$
(c) $\tan^2 A$ (d) $\sec A - \tan A$

410. The value of

$$\frac{\sin\theta+\cos\theta-1}{\sin\theta-\cos\theta+1} \times \sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$$

SSC CGL TIER-II 16/11/2020

(a) 1 (b) − 1
(c) − 2 (d) 2

411. What is the value of

$$\sqrt{\frac{\operatorname{cosec}A+1}{\operatorname{cosec}A-1}}+\sqrt{\frac{\operatorname{cosec}A-1}{\operatorname{cosec}A+1}} = ?$$

SSC CHSL 13/03/2023 (Shift-01)

(a) $2\cos A$ (b) $\sec A$
(c) $\cos A$ (d) $2\sec A$

412. Simplify the given expression

$\sqrt{\frac{1+\cos P}{1-\cos P}}$

SSC CGL 25/07/2023 (Shift-03)
SSC CGL 03/12/2022 (Shift-04)
SSC CHSL 17/08/2023 (Shift-03)

(a) cosecP–cotP (b) secP–tanP
(c) secP+tanP (d) cosecP+cotP

413. If A is an acute angle, then $\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$ is equal to:

SSC CGL 05/12/2022 (Shift-02)
SSC CGL 19/09/2024 (Shift-03)

(a) 2cosecA (b) 2cosA
(c) 2secA (d) 2sinA

414. The given expression is equivalent to:

$\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}+\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}$

SSC CGL 18/09/2024 (Shift-02)

(a) 2sinθ (b) 2cosecθ
(c) 2tanθ (d) 2tanθ secθ

415. If $\left[\left(\frac{\sec\theta-1}{\sec\theta+1}\right)\right]^n=\operatorname{cosec}\theta-\cot\theta$ then n =?

SSC CPO 09/11/2022 (Shift-01)

(a) 1 (b) 0.5
(c) –1 (d) – 0.5

416. Find the value of $\sqrt{\frac{1-\tan A}{1+\tan A}}$

SSC CPO 04/10/2023 (Shift-02)

(a) $\sqrt{\frac{1+\sin A}{\cos A}}$ (b) $\sqrt{\frac{1+\sin 2A}{\cos 2A}}$

(c) $\sqrt{\frac{1-\sin A}{\cos A}}$ (d) $\sqrt{\frac{1-\sin 2A}{\cos 2A}}$

417. Which of the following is equal to $\left[\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}\right]$?

SSC CGL TIER-II 08/08/2022

(a) $\frac{1+\cos\theta}{\sin\theta}$ (b) $\frac{1+\cot\theta}{\tan\theta}$

(c) $\frac{1+\sin\theta}{\cos\theta}$ (d) $\frac{1+\tan\theta}{\cot\theta}$

418. What is the value of $\frac{\tan\theta-\sec\theta+1}{\tan\theta+\sec\theta-1}$?

SSC CHSL 21/03/2023 (Shift-03)

(a) secθ + tanθ (b) $\frac{(1+\sin\theta)}{\cos\theta}$

(c) 2secθ (d) $\frac{\cos\theta}{(1+\sin\theta)}$

419. What is the value of $\frac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}\theta+1}$?

SSC CHSL 20/03/2023 (Shift-02)

(a) 2 secθ (b) 2 cosecθ
(c) 2 cotθ (d) (cosecθ + cotθ)

420. If A is an acute angle, which of the following is equal to $\frac{\sin A}{1+\cos A}$?

SSC CGL 09/09/2024 (Shift-03)

(a) $\frac{1-\cos A}{\sin A}$ (b) $\frac{1+\cos A}{\sin A}$

(c) $\frac{1-\sin A}{\cos A}$ (d) $\frac{1+\sin A}{\cos A}$

421. If $p=\frac{\sin A}{1+\cos A}$ then $\frac{\sin A}{1-\cos A}$ is equal to:

SSC CGL 26/09/2024 (Shift-03)

(a) $\frac{1}{p}$ (b) $\frac{1}{1-p}$

(c) $\frac{1}{p+1}$ (d) p – 1

422. Simplify. $\frac{\sin A}{1+\cos A}$ + cotA, where A is an acute angle.

SSC CGL 18/09/2024 (Shift-02)

(a) SinA (b) CosA
(c) sinA + cosA (d) cosecA

423. Simplify. $\frac{1+\sin\theta-\cos\theta}{1+\sin\theta+\cos\theta}$.

SSC CGL 24/09/2024 (Shift-03)

(a) $\cos\frac{\theta}{2}$ (b) $\sin\frac{\theta}{2}$

(c) $\cot\frac{\theta}{2}$ (d) $\tan\frac{\theta}{2}$

424. Find the value of

$\frac{\sin\theta+\cos\theta-1}{\sin\theta-\cos\theta+1}\times\frac{\tan^2\theta(\operatorname{cosec}^2\theta-1)}{\sec\theta-\tan\theta}$.

SSC CGL TIER-II 13/09/2019

(a) 0 (b) – 1

(c) 1 (d) $\frac{1}{2}$

425. $\frac{1+\sin\theta}{\cos\theta}$ is equal to which of the following $\left(\text{where } \theta\neq\frac{\pi}{2}\right)$?

SSC CGL 12/12/2022 (Shift-02)

(a) $\frac{1+\cos\theta}{\sin\theta}$ (b) $\frac{\tan\theta+1}{\tan\theta-1}$

(c) $\frac{\tan\theta-1}{\tan\theta+1}$ (d) $\frac{\cos\theta}{1-\sin\theta}$

426. Find the value of

(1 + cotA – cosecA) (1 + tanA + secA) –3(sin²A + cos²A).

SSC CPO 27/06/2024 (Shift-02)

(a) –1 (b) 1
(c) 2 (d) –2

427. Solve the following:

(tanθ + secθ + 1)(cotθ – cosecθ + 1) =?

SSC CPO 29/06/2024 (Shift-01)

(a) 2 (b) 1
(c) 0 (d) –1

428. What is the value of (1 + tanθ – secθ)(1 + cotθ + cosecθ)?

SSC CHSL 09/03/2023 (Shift-03)

(a) – 1 (b) 0
(c) 1 (d) 2

429. The value of (1 + cot A – cosec A)(1 + tanA + sec A)–1 is:

SSC CPO 09/11/2022 (Shift-02)

(a) 1 (b) 2
(c) 3 (d) 0

430. The value of (cosecA + cotA+1)(cosecA–cotA + 1) – 2cosecA is

SSC CGL 09/03/2020 (Shift-02)

(a) 4cosecA (b) 2
(c) 2cosecA (d) 0

431. What is the value of (1 + cotA + tanA) (sinA – cosA) $\left(\frac{\sin A\cos A}{\sin^3 A-\cos^3 A}\right)$?

SSC CHSL TIER-II 26/06/2023

(a) 2 (b) – 1
(c) 1 (d) 0

432. If $\tan\frac{A}{2}=x$, then find x.

SSC CGL 18/07/2023 (Shift-01)

(a) $\frac{\sqrt{1+\cos A}}{\sqrt{1-\cos A}}$ (b) $\frac{\sqrt{1-\sin A}}{\sqrt{1+\cos A}}$

(c) $\frac{\sqrt{1-\cos A}}{\sqrt{1+\cos A}}$ (d) $\frac{\sqrt{\cos A-1}}{\sqrt{1+\cos A}}$

433. Find the value of $\sqrt{\frac{1-\sin 3\theta}{1+\sin 3\theta}}$

SSC CGL 21/07/2023 (Shift-02)

(a) sec3θ – tan3θ
(b) (sec3θ – tan3θ)²
(c) (sec3θ – tan3θ)³
(d) sec3θ + tan3θ

434. What is the value of $\tan\frac{\theta}{2}$?

SSC CGL 26/07/2023 (Shift-04)

(a) $\frac{\cos\theta}{1-\sin\theta}$ (b) $\frac{\sin\theta}{1-\cos\theta}$

(c) $\frac{\cos\theta}{1-\cos\theta}$ (d) $\frac{\sin\theta}{1+\cos\theta}$

435. What is the value of $\frac{\tan A-\sin A}{\tan A+\sin A}$?

SSC CHSL 09/03/2023 (Shift-02)

(a) 1 (b) $\frac{\sec A+1}{\sec A-1}$

(c) $\frac{\sec A-1}{\sec A+1}$ (d) secA

436. If $\frac{(1-\cos\theta)}{\sin\theta}=\frac{1}{5}$, then what will be the value of $\frac{(1+\cos\theta)}{\sin\theta}$?

SSC CGL 02/12/2022 (Shift-04)

(a) 5 (b) $\frac{2}{5}$

(c) $\frac{4}{5}$ (d) $\frac{1}{5}$

437. Simplify: $\frac{\cos A}{1+\tan A}-\frac{\sin A}{1+\cot A}$

SSC CGL 03/12/2022 (Shift-01)

(a) tanA (b) cosA − sinA
(c) cosA. sinA (d) cosA + sinA

438. Simplify: $\frac{\cos A}{1-\tan A}+\frac{\sin A}{1-\cot A}$

SSC CGL 13/12/2022 (Shift-02)

(a) tanA − cotA (b) tanA + cotA
(c) sinA − cosA (d) sinA + cosA

439. Simplify the following expression:

$\frac{\cos A}{1-\tan A}+\frac{\sin A}{1-\cot A}-\sin A$

SSC CGL 19/04/2022 (Shift-03)

(a) 1 + sinA (b) (1 + sinA) cosA
(c) cosA (d) 1 + cosA

440. If 1 + sinθ = mcosθ, then what is the value of sinθ?

SSC CGL 07/12/2022 (Shift-02)

(a) $\frac{2m^2-1}{m^2+1}$ (b) $\frac{m^2-1}{m^2+1}$
(c) $\frac{m^2+1}{2m^2-1}$ (d) $\frac{m^2+1}{m^2-1}$

441. The value of $1+\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}}$, if 0° <θ<90°, is equal to:

SSC CGL 12/04/2022 (Shift-02)

(a) 1 − secθ + tanθ
(b) 1 − secθ − tanθ
(c) 1 + secθ − tanθ
(d) 1 + secθ + tanθ

442. The value of $2-\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}}$, when 0° < θ < 90° is equal to:

SSC CGL 18/04/2022 (Shift-02)

(a) 2 − sec θ + tan θ
(b) 2 + sec θ − tan θ
(c) 2 − sec θ − tan θ
(d) 2 + sec θ + tan θ

443. $1+2\tan^2\theta+2\sin\theta\sec^2\theta$, 0°< θ <90°, is equal to :

SSC CGL 16/08/2021 (Shift-01)

(a) $\frac{1-\sin\theta}{1+\sin\theta}$ (b) $\frac{1+\cos\theta}{1-\cos\theta}$
(c) $\frac{1-\cos\theta}{1+\cos\theta}$ (d) $\frac{1+\sin\theta}{1-\sin\theta}$

444. If $1+2\tan^2\theta+2\sin\theta\sec^2\theta=\frac{a}{b}$, 0°<θ< 90°, then $\frac{a+b}{a-b}=?$

SSC CGL TIER-II 29/01/2022

(a) sinθ (b) cosθ
(c) cosecθ (d) secθ

445. What is the value of

$\left(\frac{1+\sec^2 A}{1+\cos^2 A}\right)\left(\frac{1+\sin^2 A}{1+\mathrm{cosec}^2 A}\right)$?

SSC CHSL 09/03/2023 (Shift-01)

(a) cos²A (b) cosec²A
(c) sec²A (d) tan²A

446. What is the value of

$\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}+\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}$?

SSC CHSL 14/03/2023 (Shift-04)

(a) $\frac{1}{(\sin^2\theta-\cos^2\theta)}$
(b) $2(\sin^2\theta-\cos^2\theta)$
(c) $\frac{2}{(\sin^2\theta-\cos^2\theta)}$
(d) $\sin^2\theta-\cos^2\theta$

447. The value of $(2\cos^2\theta-1)\left[\frac{1+\tan\theta}{1-\tan\theta}+\frac{1-\tan\theta}{1+\tan\theta}\right]$ is:

SSC CPO 09/11/2022 (Shift-01)

(a) 2 (b) 0
(c) $\frac{\sqrt{3}}{2}$ (d) 1

448. What is the value of $\frac{1+\tan A}{\mathrm{cosec}A}+\frac{1+\cot A}{\sec A}$?

SSC CHSL 16/03/2023 (Shift-01)

(a) 2 sec²A
(b) secA + cosecA
(c) secA − cosecA
(d) 2cosec²A

449. Simplify the following expression:

$\mathrm{cosec}^4 A(1-\cos^4 A)-2\cot^2 A-1$

SSC CGL 20/04/2022 (Shift-01)

(a) 1 (b) sin²A
(c) 0 (d) cosec²A

◆ TYPE – VI ◆
asinθ + bcosθ – x, acosθ – bsinθ = y, Then, $a^2+b^2=x^2+y^2$

450. If $\sin\theta-\cos\theta=\frac{1}{5}$, then find the value of sin θ + cos θ.

SSC CHSL 02/08/2023 (Shift-04)

(a) $\frac{5}{7}$ (b) $\frac{7}{5}$
(c) $\frac{5}{3}$ (d) $\frac{3}{5}$

451. If cosθ − sinθ = $\sqrt{2}$ sinθ, then (cosθ + sinθ) is:

SSC CPO 03/10/2023 (Shift-01)

(a) $-\sqrt{2}\sin\theta$ (b) $\sqrt{2}\tan\theta$
(c) $\sqrt{2}\cos\theta$ (d) $-\sqrt{2}\cos\theta$

452. If 4 cos θ + 3 sin θ = x and 4 sin θ − 3 cos θ = y, find the value of x^2+y^2.

SSC CPO 11/11/2022 (Shift-01)

(a) 16 (b) 9
(c) 25 (d) 1

453. If sinx + cosx = $\sqrt{2}$ sinx, then the value of sinx − cosx is:

SSC CPO 28/06/2024 (Shift-02)

(a) sinx (b) 2sinx
(c) $-\sqrt{2}$ cosx (d) $\sqrt{2}$ cosx

454. If $\sin\theta+\cos\theta=\frac{\sqrt{11}}{3}$, then the value of (cosθ − sinθ) is:

SSC CPO 03/10/2023 (Shift-03)

(a) $\frac{\sqrt{5}}{3}$ (b) $\frac{7}{3}$
(c) $\frac{5}{3}$ (d) $\frac{\sqrt{7}}{3}$

455. If $\sin\theta+\cos\theta=\frac{1}{29}$, find the value of $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}$.

SSC CHSL 03/08/2023 (Shift-02)

(a) $\frac{1}{41}$ (b) $\frac{43}{29}$
(c) $\frac{41}{29}$ (d) $\frac{1}{43}$

456. If 3 sinA + 4cosA = 5, then the value of tan A is:

SSC CGL 18/09/2024 (Shift-01)

(a) $\frac{3}{4}$ (b) $\frac{3}{5}$
(c) $\frac{5}{4}$ (d) $\frac{4}{5}$

457. If a cotθ + b cosecθ = p and b cotθ + a cosecθ = q then p² − q² is equal to ______.

SSC CGL TIER-II 07/03/2023

(a) b² − a² (b) a² − b²
(c) b − a (d) a² + b²

◆ TYPE – VII ◆
CONCEPT OF VALUE PUTTING

458. The value of θ, when $\sqrt{3}$ cosθ + sinθ = 1 (1 ≤ θ ≤ 90°), is:

SSC CGL 23/09/2024 (Shift-01)

(a) 20° (b) 60°
(c) 90° (d) 30°

459. For what value of t is the value of sin² (t), half of the value of tan (t)?

SSC CGL 23/09/2024 (Shift-03)

(a) 60° (b) 45°
(c) 30° (d) 22.5°

460. The value of (1+ sin⁴A − cos⁴A) cosec²A is:

SSC CPO 03/10/2023 (Shift-02)

(a) −1 (b) 1
(c) −2 (d) 2

461. (cot θ + tan θ)(cosec θ − sin θ)(cos θ − sec θ) = -------.

SSC CHSL 03/07/2024 (Shift-01)

(a) 0 (b) 1
(c) 2 (d) −1

462. If 2tan² A + 4cos⁴ A = 3, then the possible value of A is:

SSC CHSL 04/08/2023 (Shift-04)

(a) 45° (b) 60°
(c) 0° (d) 30°

463. If m = asecA and y = btanA, then find the value of $b^2m^2 - a^2y^2 + \frac{a^2y^2}{b^2m^2} + \cos^2A$.

SSC CGL 13/09/2024 (Shift-03)

(a) a^2b^2 (b) $1-a^2b^2$
(c) $a^2b^2 + 2$ (d) $a^2b^2 + 1$

464. If m = secθ – tanθ and n = cosecθ + cotθ, then what is the value of m + n(m – 1)?

SSC CHSL 13/03/2023 (Shift-02)

(a) 2 (b) 1
(c) 0 (d) –1

465. The value of the expression $\frac{1-\sin(2t)}{1+\sin(2t)} \times \frac{\cos(t)+\sin(t)}{\cos(t)-\sin(t)}$ is:

SSC CGL 19/09/2024 (Shift-02)

(a) $\frac{1-2\tan(t)}{1+2\tan(t)}$ (b) $\frac{1-\tan(t)}{1+\tan(t)}$
(c) $\frac{1+2\tan(t)}{1-2\tan(t)}$ (d) $\frac{1+\tan(t)}{1-\tan(t)}$

466. If tanA = a tanB and sinA = b sinB, then the value of cos²A is:

SSC CHSL 05/07/2024 (Shift-01)

(a) $\frac{b^2-1}{a^2-1}$ (b) $\frac{a^2-1}{b^2-1}$
(c) $\frac{b^2+1}{a^2+1}$ (d) $\frac{a^2+1}{b^2+1}$

467. If $\cot\alpha = \frac{P}{Q}$, then find the value of $\frac{P\cos\alpha - Q\sin\alpha}{P\cos\alpha + Q\sin\alpha} - \frac{P^2-Q^2}{P^2+Q^2} + 3$.

SSC CHSL 09/07/2024 (Shift-01)

(a) $\frac{P_2}{P_2+Q_2}$ (b) $\frac{P}{Q}$
(c) 0 (d) 3

468. Which of the following is true when x = sinA + cosA; y = secA + cosecA?

SSC CPO 27/06/2024 (Shift-03)

(a) $y(1 + x^2) = 2x$ (b) $y - 2x = x^2y$
(c) $y + 2x = x^2y$ (d) $y(1-2x^2) = x$

469. What is the value of $\frac{[(\sin x + \sin y)(\sin y - \sin x)]}{[(\cos x + \cos y)(\cos y - \cos x)]}$?

SSC CPO 29/06/2024 (Shift-03)

(a) 0 (b) 1
(c) –1 (d) 2

470. If cotA + cosA = p and cot A – cosA = q. then which of the following relation is correct.?

SSC CHSL 03/08/2023 (Shift-04)

(a) $\sqrt{\frac{1}{16pq}} = p^2+q^2$

(b) $\frac{1}{4pq} = p^2+q^2$

(c) $\sqrt{16pq} = p^2-q^2$

(d) $4pq = p^2 + q^2$

471. Using trigonometric formulas, find the value of $\left(\frac{\sin(x-y)}{\sin(x+y)}\right)\left(\frac{\tan x+\tan y}{\tan x-\tan y}\right)$

SSC CGL 18/07/2023 (Shift-01)

(a) –2 (b) 2
(c) 0 (d) 1

472. Using $\operatorname{cosec}(\alpha+\beta) = \frac{\sec\alpha \times \sec\beta \times \operatorname{cosec}\alpha \times \operatorname{cosec}\beta}{\sec\alpha \times \operatorname{cosec}\beta + \operatorname{cosec}\alpha \times \sec\beta}$, find the value of cosec 75°.

SSC CGL 25/07/2023 (Shift-01)

(a) $\frac{\sqrt{6}+\sqrt{2}}{4}$ (b) $\frac{\sqrt{6}-\sqrt{2}}{4}$
(c) $\sqrt{6}-\sqrt{2}$ (d) $\sqrt{6}+\sqrt{2}$

◆ TYPE – VIII ◆
MISCELLANEOUS QUESTIONS

473. If α + β = 45° and (tanα + 1)(tanβ + 1) = 2x, then x is:

SSC CHSL 03/07/2024 (Shift-04)

(a) 2 (b) –1
(c) 0 (d) 1

474. The value of (1 + tan 10°) (1 + tan 35°) is:

SSC CHSL 25/05/2022 (Shift-03)

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$
(c) 1 (d) 2

475. The expression $\sin^2\theta + \cos^2\theta - 1 = 0$ is satisfied by how many value of θ?

SSC Phase-XII 21/06/2024 (Shift-03)

(a) No value
(b) Only one value
(c) Infinitely many values
(d) Two values

476. If a = cotA + cosA and b = cotA – cosA, then find the value of $a^2 - b^2 - 4\sqrt{ab}$.

SSC CHSL 04/08/2023 (Shift-04)

(a) 0 (b) –1
(c) 1 (d) –4

477. The value of the equation $\cos^2\theta + \sin\theta + 1 = 0$ lies between:

SSC Phase-XI 30/06/2023 (Shift-01)

(a) $\left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$ (b) $\left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$
(c) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$ (d) $\left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$

478. Let, 0° < t < 90°. Then which of the followings is true?

SSC CGL 10/09/2024 (Shift-01)

(a) sin(t) ≠ cos(t), when t = 45°
(b) sin(t) > cos(t), when t < 45°
(c) sin(t) < cos(t), when t < 45°
(d) sin(t) < cos(t), when t > 45°

479. If $2\left(\frac{\cos^2x - \sec^2x}{\tan^2x}\right) = a + b\cos2x$ then a, b = ?

SSC CGL 09/12/2022 (Shift-04)

(a) $\frac{-3}{2}, \frac{-1}{2}$ (b) $\frac{3}{2}, \frac{1}{2}$
(c) –3, –1 (d) 3, 1

480. If $x = \frac{2\sin\theta}{(1+\cos\theta+\sin\theta)}$, then the value of $\frac{1-\cos\theta+\sin\theta}{(1+\sin\theta)}$ is:

SSC CPO 09/11/2022 (Shift-01)

(a) $\frac{x}{(1+x)}$ (b) x
(c) $\frac{1}{x}$ (d) $\frac{(1+x)}{x}$

481. Let $a = \frac{2\sin x}{1+\sin x+\cos x}$ and $b = \frac{c}{1+\sin x}$. If a = b then c = ?

SSC CGL 06/06/2019 (Shift-02)

(a) 1 – sin$x$.cos$x$
(b) 1 + sin$x$ – cos$x$
(c) 1 + sin$x$.cos$x$
(d) 1 + cos$x$.sin$x$

482. If $\frac{\cos\alpha}{\sin\beta} = 10$ and $\frac{\cos\alpha}{\cos\beta} = 11$, then the value of cos²β is:

SSC CGL 21/07/2023 (Shift-03)

(a) $\frac{121}{132}$ (b) $\frac{100}{221}$
(c) $\frac{88}{108}$ (d) $\frac{221}{121}$

483. The value of sin18° is given as $\frac{\sqrt{5}-1}{4}$. Using this value, find the value of cosec18°.

SSC CHSL 30/05/2022 (Shift-02)

(a) $\frac{\sqrt{10+2\sqrt{5}}}{4}$ (b) $\sqrt{5}+1$
(c) $\frac{\sqrt{6}+\sqrt{2}}{4}$ (d) $\frac{\sqrt{10-2\sqrt{5}}}{4}$

484. What is the value of $\cos^{-1}\left(\frac{7}{25}\right) - \cos^{-1}\left(\frac{15}{17}\right)$

SSC CHSL 11/07/2024 (Shift-02)

(a) $\sin^{-1}\left(\frac{304}{425}\right)$

(b) $\cot^{-1}\left(\frac{297}{425}\right)$

(c) $\tan^{-1}\left(\frac{297}{425}\right)$

(d) $\cos^{-1}\left(\frac{304}{425}\right)$

• TYPE – IX (A) •
TRIGONOMETRIC FUNCTIONS OF 2A & 3A

485. If $\cos^4\theta - \sin^4\theta = \frac{4}{5}$, then find the value of $\sin 4\theta$.

SSC CHSL 08/07/2024 (Shift-04)

(a) $\frac{24}{25}$ (b) $\frac{21}{25}$

(c) $\frac{16}{25}$ (d) $\frac{18}{25}$

486. What is the value of $\cos^2 15°$?

SSC CGL 06/12/2022 (Shift-04)

(a) $(2+\sqrt{3})$ (b) $\frac{(2+\sqrt{3})}{4}$

(c) $\frac{(2+\sqrt{3})}{2}$ (d) $\frac{(1+\sqrt{3})}{2}$

487. Solve for θ : $\cos^2\theta - \sin^2\theta = \frac{1}{2}$, $0 < \theta < 90°$.

SSC CPO 25/11/2020 (Shift-2)

(a) 45° (b) 60°

(c) 40° (d) 30°

488. If $\sin\theta = \frac{6}{10}$ and $\cos\theta = \frac{8}{10}$, then $\sin 2\theta$ = ________.

SSC CHSL 11/08/2023 (Shift-03)

(a) $\frac{10}{8}$ (b) $\frac{12}{10}$

(c) $\frac{16}{10}$ (d) $\frac{24}{25}$

489. Using the formula $\tan\frac{x}{2} = \frac{1-\cos x}{\sin x}$, find the value of tan 22.5°.

SSC CHSL 10/06/2022 (Shift- 01)

(a) $\sqrt{2}-1$ (b) $\sqrt{2}+1$

(c) $\frac{\sqrt{3}+\sqrt{2}}{2}$ (d) $\frac{\sqrt{3}-\sqrt{2}}{2}$

490. If $4\tan\theta - 3 = 0$, then the value of $\frac{1-\cos 2\theta}{1+\cos 2\theta}$ is?

SSC CGL 23/09/2024 (Shift-01)

(a) 1 (b) $\frac{7}{15}$

(c) $\frac{4}{3}$ (d) $\frac{9}{16}$

491. The value of $\left(\frac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta}\right)^2 + 1, \theta \neq 45°$ is:

SSC CPO 28/06/2024 (Shift-03)

(a) $\sin^2\theta$ (b) $\sec^2\theta$

(c) $\mathrm{cosec}^2\theta$ (d) $\cot^2\theta$

492. $\frac{2\tan A}{1+\tan^2 A} = ?$

SSC CGL 20/07/2023 (Shift-02)

(a) cos2A (b) sinA

(c) cosA (d) sin2A

493. Simplify the following expression

$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$$

SSC CGL 21/07/2023 (Shift-03)

(a) $\tan\theta$ (b) $\sin\theta$

(c) $\sec\theta$ (d) $\cos\theta$

494. The value of $\frac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta}$ is:

SSC CPO 10/11/2022 (Shift-01)

(a) $\sec\theta$ (b) $\sin\theta$

(c) $\cot\theta$ (d) $\tan\theta$

495. Evaluate the following:

$$\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}}$$

SSC CGL 27/07/2023 (Shift-03)

(a) $2\cos\theta$ (b) $2\cos 2\theta$

(c) $\sin 2\theta$ (d) $\cos 2\theta$

496. If $(2\cos^3 A - \cos A) / (\sin A - 2\sin^3 A) = 1$, then what is the value of A?

SSC CHSL 21/03/2023 (Shift-02)

(a) 90° (b) 30°

(c) 45° (d) 60°

497. If 0° < A, B < 45°, $\cos(A+B) = \frac{24}{25}$ and $\sin(A-B) = \frac{15}{17}$, then tan2A = ?

SSC CGL 06/03/2020 (Shift-02)

(a) 0 (b) 1

(c) $\frac{416}{87}$ (d) $\frac{213}{4}$

498. $3\sin A - 4\sin^3 A = ?$

SSC CHSL 02/06/2022 (Shift- 01)

(a) cot3A (b) sin3A

(c) cos3A (d) tan3A

499. Find the value of $3\sin 15° - 4\sin^3 15°$.

SSC CGL 25/09/2024 (Shift-03)

(a) 2 (b) $\frac{1}{2}$

(c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$

• TYPE – IX (B) •
SUM & DIFFERENCE OF ANGLES OF TRIGONOMETRIC RATIOS

500. If A = 60°, B = 30°, then find the value of sinA cosB + cosA sinB.

SSC CHSL 02/08/2023 (Shift-02)

(a) 0 (b) 12

(c) 13 (d) 1

501. using cos (A + B) = cosA cosB – sinA sin B, find the value of cos75°

SSC CGL 17/07/2023 (Shift-03)

(a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{\sqrt{5}+1}{4}$

(c) $\frac{\sqrt{6}-\sqrt{2}}{4}$ (d) $\frac{\sqrt{6}+\sqrt{2}}{4}$

502. Let ABC be a right angled triangle with a right angle at B. If $\tan A = \sqrt{3}$, then find the value of sinA cosC + cosA sinC and cosA cosC – sinA sinC.

SSC CGL TIER-II (18/01/2025)

(a) $\frac{\sqrt{3}}{2}, \frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}, \frac{\sqrt{3}}{2}$

(c) $\frac{1}{2}, \frac{1}{2}$ (d) 1, 0

503. What is the value of $\cos(x+y) - \sin(x-y) + \tan(2z)$?

SSC CHSL 02/07/2024 (Shift-01)

(a) $\cos x.\cos y - \sin x.\sin y - \sin x.\cos y - \cos x.\sin y + \frac{2\tan z}{1-\tan^2 z}$

(b) $\cos x.\cos y - \sin x.\sin y - \sin x.\cos y + \cos x.\sin y + \frac{2\tan z}{1-\tan^2 z}$

(c) $\cos x.\cos y - \sin x.\sin y - \sin x.\cos y + \cos x.\sin y + \frac{\tan z}{1-\tan^2 z}$

(d) $\sin x.\sin y + \frac{2\tan z}{1-\tan^2 z}$

504. Find the value of tan 72° – tan 27° – tan 72° tan 27°.

SSC CGL 25/09/2024 (Shift-02)

(a) –1 (b) 1

(c) –2 (d) 0

505. If sin(X – Y) = sinXcosY – cosXsinY, then the value of $\frac{\sin(A-B)}{\cos A\cos B} + \frac{\sin(B-C)}{\cos B\cos C}$ is:

SSC CHSL 05/07/2024 (Shift-02)

(a) $\frac{\sin(C-A)}{\cos A\cos C}$ (b) $\frac{\sin(A-C)}{\cos A\cos C}$

(c) $\frac{\cos(A+C)}{\cos A\cos C}$ (d) $\frac{\cos(A+C)}{\cos A\sin C}$

506. $\left[\frac{\mathrm{cosec}31° - \sec 59°}{(\sin 18° + \cos 72°)} \times \frac{\tan 26°}{\cot 64°}\right] + \left[\frac{\tan 30° + \tan 15°}{(1-\tan 30°\tan 15°)}\right]$ = ________.

SSC CHSL 08/07/2024 (Shift-04)

(a) 0 (b) –1

(c) 1 (d) 2

507. Simplify: $\frac{\cos 13° + \sin 13°}{\cos 13° - \sin 13°}$

SSC CPO 28/06/2024 (Shift-01)

(a) cot 58° (b) tan 32°

(c) tan 58° (d) cos 26°

508. Simplify: $\frac{\tan 71° + \tan 19°}{1-\tan 71°\tan 19°}$

SSC CPO 29/06/2024 (Shift-02)

(a) Not defined (b) 1

(c) $\sqrt{3}$ (d) 0

509. Using $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$, find the value of tan 15°.

SSC CGL 18/07/2023 (Shift-04)

(a) $\sqrt{3} + 1$ (b) $\sqrt{3} - 1$

(c) $2 - \sqrt{3}$ (d) $2 + \sqrt{3}$

510. If sin(A + B) = cos(A + B), what is the value of tanA?

SSC CGL 02/12/2022 (Shift-01)

(a) $\dfrac{1 - \tan B}{1 + \tan B}$ (b) $\dfrac{1 + \tan B}{1 - \tan B}$

(c) $\dfrac{1 + \sec B}{1 - \sec B}$ (d) $\dfrac{1 - \operatorname{cosec} B}{1 + \operatorname{cosec} B}$

511. If $\sin A = \dfrac{4}{5}$ and $\sin B = \dfrac{15}{17}$, what is the value of sin(A – B)?

SSC CGL 02/12/2022 (Shift-04)

(a) $-\dfrac{32}{45}$ (b) $-\dfrac{13}{85}$

(c) $\dfrac{13}{85}$ (d) $\dfrac{32}{45}$

512. Simplify the following:

$\dfrac{\cos x - \sqrt{3}\sin x}{2}$

SSC CGL 03/12/2022 (Shift-03)

(a) $\cot\left(\dfrac{\pi}{3} - x\right)$ (b) $\sin\left(\dfrac{\pi}{3} + x\right)$

(c) $\cos\left(\dfrac{\pi}{3} + x\right)$ (d) $\sin\left(\dfrac{\pi}{3} - x\right)$

513. If tan A – tan B – tan C = tan A tan B tan C, what is the value of A in terms of B and C?

SSC CGL 07/12/2022 (Shift-01)

(a) A = B + C (b) A = 2B – 2C

(c) A = B – C (d) $A = \dfrac{B - C}{2}$

514. If tan(α + β) = a, tan(α – β) = b, then the value of tan2α is:

SSC CGL 13/12/2022 (Shift-04)

(a) $\dfrac{a + b}{1 - ab}$ (b) $\dfrac{a + b}{1 + ab}$

(c) $\dfrac{a - b}{1 + ab}$ (d) $\dfrac{a - b}{1 - ab}$

515. If $\tan A \tan B + \dfrac{\cos x}{\cos A \cos B} = 1$, then $x = ?$

SSC CGL 08/12/2022 (Shift-04)

(a) A (b) B

(c) A + B (d) A – B

516. Given that A and B are second quadrant angles, $\sin A = \dfrac{1}{3}$ and $\sin B = \dfrac{1}{5}$, then find the value of cos (A – B).

SSC CPO 09/11/2022 (Shift-03)

(a) $\dfrac{4\sqrt{3} + 1}{15}$ (b) $\dfrac{8\sqrt{3} - 1}{15}$

(c) $\dfrac{8\sqrt{3} + 1}{15}$ (d) $\dfrac{4\sqrt{3} - 1}{15}$

517. What is the value of $\dfrac{\sin(A + B)}{\sin A \cos B}$?

SSC CPO 09/11/2022 (Shift-03)

(a) 1 + cot A tan B

(b) 1 + tan A cot B

(c) 1 – sin A cos B

(d) 1 – cot A tan B

◆ TYPE – IX (C) ◆
TRANSFORMATION OF SUM OR DIFFERENCE INTO PRODUCT

518. Find the value of:

(sin 75° + sin 15°).

SSC Phase-XII 21/06/2024 (Shift-03)

(a) $\dfrac{\sqrt{6}}{2}$ (b) $\sqrt{6}$

(c) $\dfrac{\sqrt{3}}{2}$ (d) $\sqrt{3}$

519. Simplify the following:

$\sin 2x + 2\sin 4x + \sin 6x$

SSC CGL 18/07/2023 (Shift-02)

(a) $4\cos^2 x \sin 4x$

(b) $4\cos^2 x \sin x$

(c) $2\cos^2 x \sin 4x$

(d) $4\sin^2 x \sin 4x$

520. What is sinα – sinβ ?

SSC CGL 01/12/2022 (Shift-02)

(a) $2\cos\dfrac{\alpha + \beta}{2}\sin\dfrac{\alpha - \beta}{2}$

(b) $2\sin\dfrac{\alpha + \beta}{2}\sin\dfrac{\alpha - \beta}{2}$

(c) $2\cos\dfrac{\alpha - \beta}{2}\sin\dfrac{\alpha + \beta}{2}$

(d) $2\cos\dfrac{\alpha + \beta}{2}\cos\dfrac{\alpha - \beta}{2}$

521. The value of $\dfrac{\sin 4\theta + \sin 2\theta}{\cos 4\theta + \cos 2\theta}$ is:

SSC CHSL 27/05/2022 (Shift-01)

(a) tan3θ (b) cot3θ

(c) tanθ (d) cotθ

◆ TYPE – IX (D) ◆
TRANSFORMATION OF PRODUCT INTO SUM OR DIFFERENCE

522. Evaluate the following:

cos(36° + A).cos(36° – A) + cos(54° + A).cos(54° – A)

SSC CGL 14/07/2023 (Shift-02)

(a) sin 2A (b) cos A

(c) sin A (d) cos 2A

523. Using 2cosA cosB = cos(A + B) + cos(A – B), find the value of cos75°cos15°.

SSC CHSL 01/06/2022 (Shift-02)

(a) $\dfrac{1}{2}$ (b) $\dfrac{1}{4}$

(c) $\dfrac{\sqrt{3}}{2}$ (d) $\dfrac{\sqrt{3}}{4}$

524. sinA sinB = ________.

SSC CGL 18/09/2024 (Shift-03)

(a) $\dfrac{1}{2}\{\sin(A + B) + \sin(A - B)\}$

(b) $\dfrac{1}{2}\{\sin(A + B) - \sin(A - B)\}$

(c) $\dfrac{1}{2}\{\cos(A + B) + \cos(A - B)\}$

(d) $\dfrac{1}{2}\{\cos(A - B) - \cos(A + B)\}$

525. Simplify: $\dfrac{\sin 8\theta \cos\theta - \sin 6\theta \cos 3\theta}{\cos 2\theta \cos\theta - \sin 3\theta \sin 4\theta}$

SSC CPO 09/11/2022 (Shift-02)

(a) cotθ (b) cot2θ

(c) tanθ (d) tan2θ

◆ TYPE – IX (E) ◆
MAXIMUM/MINIMUM VALUES OF TRIGONOMETRIC FUNCTIONS

526. The maximum value of (2sinθ + 3cosθ)

SSC CGL 19/09/2024 (Shift-02)

(a) $\sqrt{17}$ (b) $\sqrt{11}$

(c) 9 (d) $\sqrt{13}$

527. What is the maximum value of 7cosA + 24sinA + 32?

SSC CHSL 09/07/2024 (Shift-04)

(a) 57 (b) 32

(c) 25 (d) 39

528. Find the maximum value of (19sinθ + 6cotθ sinθ)

SSC CPO 27/06/2024 (Shift-03)

(a) $\sqrt{397}$ (b) $\sqrt{197}$

(c) $\sqrt{297}$ (d) $\sqrt{497}$

529. Find the least value of $16\operatorname{cosec}^2\theta + 25\sin^2\theta$.

SSC CPO 04/10/2023 (Shift-03)

(a) 35 (b) 38

(c) 42 (d) 40

530. The least value of cosθ sinθ is:

SSC CGL TIER-II 16/10/2020

(a) $\left(\dfrac{1}{2}\right)$ (b) 0

(c) (– 1) (d) $\left(-\dfrac{1}{2}\right)$

531. The maximum value of $(\sin^{12}\theta + \cos^{20}\theta)$ for all the real values of θ is:

SSC CGL 20/07/2023 (Shift-03)

(a) 2 (b) 3

(c) 1 (d) 0

532. The greatest value of $\sin^4\theta + \cos^4\theta$ is:

SSC CGL 26/09/2024 (Shift-03)

(a) 2 (b) 1

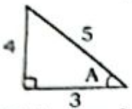
(c) 3 (d) 4

ANSWER KEY

1.	(c)	2.	(d)	3.	(c)	4.	(d)	5.	(a)	6.	(c)	7.	(d)	8.	(b)	9.	(a)	10.	(b)
11.	(a)	12.	(c)	13.	(d)	14.	(c)	15.	(c)	16.	(b)	17.	(a)	18.	(b)	19.	(c)	20.	(c)
21.	(d)	22.	(c)	23.	(b)	24.	(d)	25.	(c)	26.	(d)	27.	(d)	28.	(c)	29.	(b)	30.	(b)
31.	(d)	32.	(b)	33.	(c)	34.	(b)	35.	(c)	36.	(c)	37.	(d)	38.	(a)	39.	(c)	40.	(a)
41.	(a)	42.	(a)	43.	(a)	44.	(c)	45.	(c)	46.	(a)	47.	(c)	48.	(d)	49.	(c)	50.	(b)
51.	(a)	52.	(d)	53.	(a)	54.	(c)	55.	(c)	56.	(a)	57.	(d)	58.	(b)	59.	(c)	60.	(b)
61.	(b)	62.	(c)	63.	(c)	64.	(a)	65.	(a)	66.	(d)	67.	(c)	68.	(a)	69.	(a)	70.	(c)
71.	(a)	72.	(b)	73.	(b)	74.	(c)	75.	(a)	76.	(d)	77.	(c)	78.	(d)	79.	(b)	80.	(a)
81.	(c)	82.	(d)	83.	(c)	84.	(a)	85.	(d)	86.	(b)	87.	(b)	88.	(d)	89.	(a)	90.	(c)
91.	(d)	92.	(d)	93.	(a)	94.	(a)	95.	(b)	96.	(c)	97.	(a)	98.	(a)	99.	(c)	100.	(a)
101.	(a)	102.	(c)	103.	(b)	104.	(a)	105.	(a)	106.	(b)	107.	(b)	108.	(a)	109.	(c)	110.	(c)
111.	(a)	112.	(d)	113.	(b)	114.	(a)	115.	(b)	116.	(c)	117.	(a)	118.	(b)	119.	(b)	120.	(c)
121.	(b)	122.	(b)	123.	(b)	124.	(a)	125.	(b)	126.	(b)	127.	(a)	128.	(d)	129.	(d)	130.	(c)
131.	(a)	132.	(b)	133.	(b)	134.	(c)	135.	(c)	136.	(b)	137.	(d)	138.	(a)	139.	(b)	140.	(a)
141.	(a)	142.	(b)	143.	(d)	144.	(a)	145.	(b)	146.	(a)	147.	(a)	148.	(a)	149.	(c)	150.	(b)
151.	(a)	152.	(a)	153.	(b)	154.	(c)	155.	(a)	156.	(d)	157.	(c)	158.	(d)	159.	(d)	160.	(d)
161.	(c)	162.	(d)	163.	(a)	164.	(a)	165.	(b)	166.	(d)	167.	(a)	168.	(b)	169.	(d)	170.	(c)
171.	(a)	172.	(d)	173.	(d)	174.	(c)	175.	(a)	176.	(c)	177.	(c)	178.	(b)	179.	(a)	180.	(d)
181.	(b)	182.	(a)	183.	(d)	184.	(a)	185.	(c)	186.	(d)	187.	(b)	188.	(b)	189.	(c)	190.	(d)
191.	(c)	192.	(b)	193.	(c)	194.	(a)	195.	(d)	196.	(d)	197.	(a)	198.	(a)	199.	(b)	200.	(c)
201.	(b)	202.	(d)	203.	(d)	204.	(d)	205.	(c)	206.	(c)	207.	(a)	208.	(b)	209.	(c)	210.	(c)
211.	(d)	212.	(a)	213.	(b)	214.	(d)	215.	(b)	216.	(a)	217.	(d)	218.	(c)	219.	(b)	220.	(d)
221.	(b)	222.	(d)	223.	(b)	224.	(a)	225.	(a)	226.	(a)	227.	(c)	228.	(c)	229.	(c)	230.	(a)
231.	(a)	232.	(d)	233.	(a)	234.	(a)	235.	(d)	236.	(c)	237.	(c)	238.	(a)	239.	(c)	240.	(b)
241.	(c)	242.	(b)	243.	(a)	244.	(a)	245.	(a)	246.	(d)	247.	(c)	248.	(d)	249.	(d)	250.	(d)
251.	(b)	252.	(d)	253.	(a)	254.	(d)	255.	(b)	256.	(c)	257.	(a)	258.	(b)	259.	(b)	260.	(b)
261.	(c)	262.	(a)	263.	(d)	264.	(c)	265.	(d)	266.	(c)	267.	(a)	268.	(b)	269.	(b)	270.	(c)
271.	(b)	272.	(d)	273.	(c)	274.	(b)	275.	(a)	276.	(c)	277.	(c)	278.	(a)	279.	(b)	280.	(c)
281.	(c)	282.	(d)	283.	(b)	284.	(a)	285.	(d)	286.	(a)	287.	(c)	288.	(a)	289.	(b)	290.	(d)
291.	(b)	292.	(d)	293.	(b)	294.	(b)	295.	(a)	296.	(b)	297.	(c)	298.	(d)	299.	(a)	300.	(d)
301.	(b)	302.	(b)	303.	(a)	304.	(c)	305.	(b)	306.	(a)	307.	(c)	308.	(b)	309.	(d)	310.	(a)
311.	(b)	312.	(c)	313.	(b)	314.	(c)	315.	(c)	316.	(c)	317.	(c)	318.	(c)	319.	(b)	320.	(c)
321.	(b)	322.	(a)	323.	(b)	324.	(d)	325.	(d)	326.	(a)	327.	(a)	328.	(c)	329.	(a)	330.	(b)
331.	(b)	332.	(c)	333.	(c)	334.	(a)	335.	(c)	336.	(c)	337.	(a)	338.	(a)	339.	(c)	340.	(c)
341.	(d)	342.	(a)	343.	(d)	344.	(c)	345.	(a)	346.	(c)	347.	(a)	348.	(a)	349.	(d)	350.	(c)
351.	(d)	352.	(d)	353.	(b)	354.	(d)	355.	(c)	356.	(b)	357.	(d)	358.	(d)	359.	(a)	360.	(a)
361.	(a)	362.	(a)	363.	(a)	364.	(d)	365.	(c)	366.	(c)	367.	(c)	368.	(b)	369.	(a)	370.	(b)
371.	(c)	372.	(d)	373.	(c)	374.	(a)	375.	(c)	376.	(d)	377.	(a)	378.	(c)	379.	(b)	380.	(d)
381.	(b)	382.	(d)	383.	(d)	384.	(b)	385.	(a)	386.	(b)	387.	(a)	388.	(c)	389.	(a)	390.	(d)
391.	(d)	392.	(d)	393.	(a)	394.	(b)	395.	(d)	396.	(b)	397.	(b)	398.	(b)	399.	(c)	400.	(b)
401.	(a)	402.	(d)	403.	(d)	404.	(b)	405.	(d)	406.	(a)	407.	(a)	408.	(a)	409.	(d)	410.	(a)
411.	(d)	412.	(d)	413.	(a)	414.	(b)	415.	(b)	416.	(d)	417.	(c)	418.	(d)	419.	(d)	420.	(a)
421.	(a)	422.	(d)	423.	(d)	424.	(c)	425.	(d)	426.	(a)	427.	(a)	428.	(d)	429.	(a)	430.	(b)
431.	(c)	432.	(c)	433.	(a)	434.	(d)	435.	(c)	436.	(a)	437.	(b)	438.	(d)	439.	(c)	440.	(b)
441.	(d)	442.	(c)	443.	(d)	444.	(c)	445.	(d)	446.	(c)	447.	(a)	448.	(b)	449.	(c)	450.	(b)
451.	(c)	452.	(c)	453.	(d)	454.	(d)	455.	(a)	456.	(a)	457.	(a)	458.	(c)	459.	(b)	460.	(d)
461.	(d)	462.	(a)	463.	(d)	464.	(d)	465.	(b)	466.	(a)	467.	(d)	468.	(c)	469.	(c)	470.	(c)
471.	(d)	472.	(c)	473.	(d)	474.	(d)	475.	(c)	476.	(a)	477.	(b)	478.	(c)	479.	(c)	480.	(b)
481.	(b)	482.	(b)	483.	(b)	484.	(a)	485.	(a)	486.	(b)	487.	(d)	488.	(d)	489.	(a)	490.	(d)
491.	(c)	492.	(d)	493.	(a)	494.	(c)	495.	(a)	496.	(c)	497.	(c)	498.	(b)	499.	(c)	500.	(d)
501.	(c)	502.	(d)	503.	(b)	504.	(b)	505.	(b)	506.	(c)	507.	(c)	508.	(a)	509.	(c)	510.	(a)
511.	(b)	512.	(c)	513.	(a)	514.	(a)	515.	(c)	516.	(c)	517.	(a)	518.	(a)	519.	(a)	520.	(a)
521.	(a)	522.	(d)	523.	(b)	524.	(d)	525.	(d)	526.	(d)	527.	(a)	528.	(a)	529.	(d)	530.	(d)
531.	(c)	532.	(b)																

SOLUTIONS

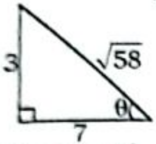
1. (c) $\tan A = \frac{4}{3}$



With the help of triplet (3, 4, 5),
Hypotenuse = 5

$\therefore \sin A = \frac{4}{5}$

2. (d) $\tan(t) = \frac{3}{7}$



$h^2 = p^2 + b^2$

$\Rightarrow h^2 = 3^2 + 7^2 \Rightarrow h = \sqrt{58}$

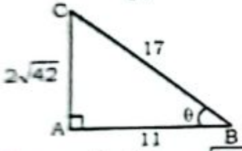
$\therefore \operatorname{cosec}(t) = \frac{h}{p} = \frac{\sqrt{58}}{3}$

Alternate Method:

$\operatorname{cosec}(t) = \sqrt{1+\cot^2 t}$

$= \sqrt{1+\frac{49}{9}} = \frac{\sqrt{58}}{3}$

3. (c) $\cos\theta = \frac{11}{17}$



Perpendicular $= \sqrt{17^2 - 11^2} = 2\sqrt{42}$

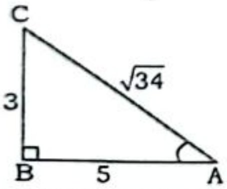
$\therefore \tan\theta = \frac{2\sqrt{42}}{11}$

4. (d) $\sin\theta = \frac{13}{19}$

$\cos\theta = \sqrt{1-\sin^2\theta} = \sqrt{1-\frac{169}{361}}$

$= \frac{\sqrt{192}}{19} = \frac{8\sqrt{3}}{19}$

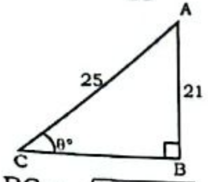
5. (a) $\tan A = \frac{3}{5}$



Hypotenuse (AC) $= \sqrt{5^2+3^2}$

$= \sqrt{25+9} = \sqrt{34}$ $\therefore \cos A = \frac{5}{\sqrt{34}}$

6. (c) $\sin\theta = \frac{21}{25}$

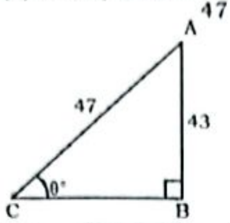


$BC = \sqrt{25^2 - 21^2} = \sqrt{625-441}$

$= \sqrt{184} = 2\sqrt{46}$

$\tan\theta = \frac{21}{2\sqrt{46}}$

7. (d) Given, $\sin\theta = \frac{43}{47}$



$BC = \sqrt{47^2 - 43^2} = \sqrt{90 \times 4} = 6\sqrt{10}$

$\therefore \cot\theta = \frac{6\sqrt{10}}{43}$

8. (b) We know that,

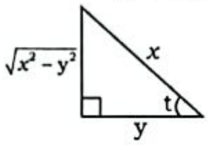
$\tan x = \frac{5}{1} = \frac{P}{B}$

By Pythagoras Theorm,

$H = \sqrt{P^2 + B^2} = \sqrt{5^2+1^2} = \sqrt{26}$

$\operatorname{Sin} x = \frac{P}{B} = \frac{5}{\sqrt{26}}$

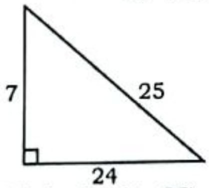
9. (a) $\sec(t) = \frac{x \to \text{Hypotenous}}{y \to \text{base}}$



Perpendicular $= \sqrt{x^2 - y^2}$

$\therefore \cot(t) = \frac{y}{\sqrt{x^2-y^2}}$

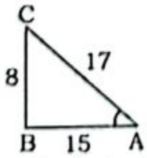
10. (b) $\cos\theta = \frac{24 \to \text{Base}}{25 \to \text{Hypotenuse}}$



Triplet (7, 24, 25)

$\therefore \cot(90° - \theta) = \tan\theta = \frac{7}{24}$

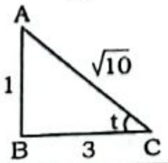
11. (a) $\cos A = \frac{15 \to \text{Base}}{17 \to \text{Hypotenuse}}$



With the help of triplet (8, 15, 17),
Perpendicular = 8
$\cot(90° - A) = \tan A$

$\therefore \tan A = \frac{8}{15}$

12. (c)



Given,

$\tan t = \frac{1 \to P}{3 \to B}$

$AC = \sqrt{3^2+1^2} = \sqrt{10}$

$\therefore \sec t = \frac{\sqrt{10}}{3}$

Alternate Method:

$\tan t = \frac{1}{3}$

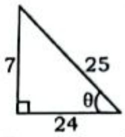
We know that,
$\sec^2 t - \tan^2 t = 1$

$\Rightarrow \sec^2 t - \frac{1}{9} = 1$

$\Rightarrow \sec^2 t = \frac{10}{9}$

$\Rightarrow \sec t = \frac{\sqrt{10}}{3}$

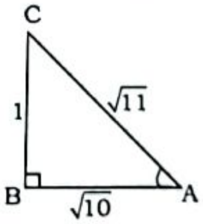
13. (d) $\sin\theta = \frac{7}{25}$



By triplet of 7, 24, 25
Base = 24

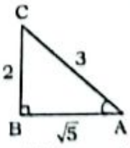
$\cos\theta = \frac{24}{25}, \tan\theta = \frac{7}{24}$

14. (c) $\tan A = \frac{1}{\sqrt{10}}$



$\therefore \sin A + \operatorname{cosec} A = \frac{1}{\sqrt{11}} + \frac{\sqrt{11}}{1} = \frac{12}{\sqrt{11}}$

15. (c) $\sin A = \frac{2}{3}$



$\therefore (7 - \tan A)(3 + \cos A)$

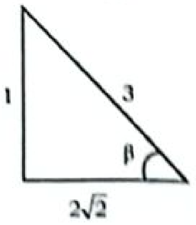
$= \left(7 - \frac{2}{\sqrt{5}}\right)\left(3 + \frac{\sqrt{5}}{3}\right)$

$= \left(\frac{7\sqrt{5}-2}{\sqrt{5}}\right)\left(\frac{9+\sqrt{5}}{3}\right)$

$= \frac{63\sqrt{5}+35-18-2\sqrt{5}}{3\sqrt{5}}$

$= \frac{61\sqrt{5}+17}{3\sqrt{5}} = \frac{61}{3} + \frac{17}{3\sqrt{5}}$

16. (b) $\sin\beta = \frac{1}{3}$

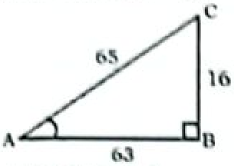


$\therefore (\sec\beta - \tan\beta)^2 = \left(\frac{3}{2\sqrt{2}} - \frac{1}{2\sqrt{2}}\right)^2 = \frac{1}{2}$

17. (a) Given,

$\cos A = \frac{63}{65}$

With the help of triplet (16, 63, 65), perpendicular = 16



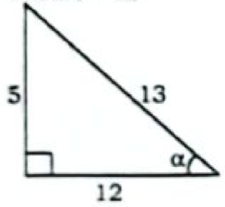
$\therefore \tan A + \cot A$

$= \frac{16}{63} + \frac{63}{16} = \frac{256+3969}{1008} = \frac{4225}{1008} = 4.19$

18. (b) $\sin\alpha = \frac{5}{13}$

[5, 12, 13 → Triplet]

⇒ Base = 12

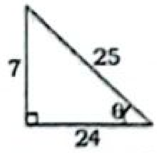


$\therefore \cos\alpha \ \text{cosec}\alpha \times \cot\alpha = \frac{\cos\alpha}{\sin\alpha} \times \cot\alpha$

$= \cot^2\alpha = \left(\frac{12}{5}\right)^2 = \frac{144}{25}$

19. (c) $\tan\theta = \frac{7}{24}$

[7, 24, 25, → Triplet]



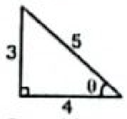
$\therefore \cos^2\theta - \sin^2\theta$

$= \left(\frac{24}{25}\right)^2 - \left(\frac{7}{25}\right)^2 = \frac{576}{625} - \frac{49}{625} = \frac{527}{625}$

20. (c) Given,

$\cot\theta = \frac{4}{3}$

With the help of triplet (3, 4, 5), Hypotenuse = 5



Consider,

$5p\cos^2\theta\sin\theta = \cot^2\theta$

$\Rightarrow 5p\left(\frac{4}{5}\right)^2 \times \frac{3}{5} = \left(\frac{4}{3}\right)^2 \Rightarrow p = \frac{25}{27}$

21. (d) $\cot\theta.\sin\theta.\cos\theta$

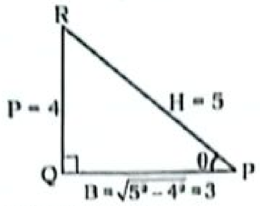
$= \frac{\cos\theta}{\sin\theta} \times \sin\theta \times \cos\theta$

$= \cos^2\theta = 1 - \sin^2\theta$

Put $\sin\theta = \frac{5}{6}$

$\Rightarrow 1 - \frac{25}{36} = \frac{11}{36}$

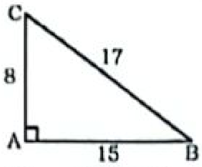
22. (c) $\sin\theta = \frac{4}{5}$



$\therefore \tan\theta - \cot\theta$

$= \frac{P}{B} - \frac{B}{P} = \frac{4}{3} - \frac{3}{4} = \frac{7}{12}$

23. (b) Given, $\cot B = \frac{15 \to \text{Base}}{8 \to P}$



$BC = \sqrt{15^2 + 8^2} = 17$

$\therefore \sec B + \tan B$

$= \frac{17}{15} + \frac{8}{15} = \frac{25}{15} = \frac{5}{3}$

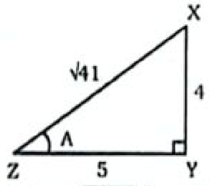
24. (d) $\sin A = \frac{8}{17}$

using triplet (8, 15, 17),

Base = 15

$\therefore \cot A + \sec A = \frac{15}{8} + \frac{17}{15} = \frac{361}{120} = 3\frac{1}{120}$

25. (c) $4\cot A = 5 \Rightarrow \cot A = \frac{5}{4}$



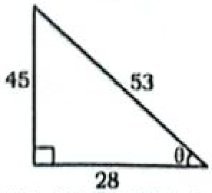
$XZ = \sqrt{4^2 + 5^2} = \sqrt{41}$

$\therefore 6\sec A \times \tan A$

$= 6 \times \frac{\sqrt{41}}{5} \times \frac{4}{5} = \frac{24\sqrt{41}}{25}$

26. (d) $\cot\theta = \frac{28}{45}$

$\Rightarrow \cot\theta = \frac{b}{p} = \frac{28}{45}$



(45, 28, 53 Triplet)

$\therefore \sin\theta - \cos\theta = \frac{45}{53} - \frac{28}{53} = \frac{17}{53}$

27. (d) $3\tan A = 4$

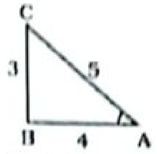
$\Rightarrow \tan A = \frac{4}{3}$, (Triplet of 3, 4, 5)

$\therefore 4\sin A + 3\cos A$

$= 4 \times \frac{4}{5} + 3 \times \frac{3}{5}$

$= \frac{16}{5} + \frac{9}{5} = \frac{25}{5} = 5$

28. (c) $\cos A = \frac{4}{5} = \frac{B}{H}$



[3, 4, 5 triplet]

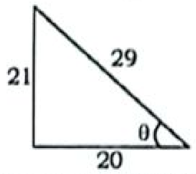
$\sin A = \frac{3}{5}$, $\tan A = \frac{3}{4}$

$\therefore (8 + \sin A)(3 - \tan A)$

$= \left(8 + \frac{3}{5}\right)\left(3 - \frac{3}{4}\right) = \frac{43}{5} \times \frac{9}{4}$

$= \frac{387}{20}$

29. (b) $\sec\theta = \frac{29}{20}$



By triplet of 20, 21, 29

perpendicular = 21

$\therefore 3\text{cosec}\theta + 3\cot\theta = 3(\text{cosec}\theta + \cot\theta)$

$= 3\left(\frac{29}{21} + \frac{20}{21}\right) = 3 \times \frac{49}{21} = 7$

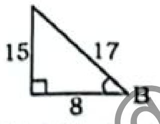
30. (b) Given, $4\tan A = 3$

$\Rightarrow \tan A = \frac{3 \to P}{4 \to B}$

H = 5

$\therefore \cos^2 A - \sin^2 A = \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$

31. (d) $\sin B = \frac{15}{17}$



Triplet(8, 15, 17)

Base = 8

$\therefore \cos B(\sec B - \tan B)$

$= \frac{8}{17}\left(\frac{17}{8} - \frac{15}{8}\right)$

$= \frac{8}{17} \times \frac{2}{8} = \frac{2}{17}$

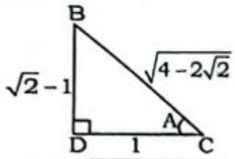
Alternate Method:-

$\cos B(\sec B - \tan B)$

$= 1 - \sin B$

$= 1 - \frac{15}{17} = \frac{2}{17}$

32. (b) $\tan A = \sqrt{2} - 1$



$BC = \sqrt{2+1-2\sqrt{2}+1} = \sqrt{4-2\sqrt{2}}$

$\therefore \sin A \cos A + \tan A =$

$$\frac{\sqrt{2}-1}{\left(\sqrt{4-2\sqrt{2}}\right)^2} + \sqrt{2} - 1 = \frac{\sqrt{2}-1}{4-2\sqrt{2}} + \sqrt{2} - 1$$

$$= \frac{1}{2\sqrt{2}} + \sqrt{2} - 1 = \frac{1+4-2\sqrt{2}}{2\sqrt{2}}$$

$$= \frac{5-2\sqrt{2}}{2\sqrt{2}} = \frac{5\sqrt{2}-4}{4}$$

33. (c) $\sqrt{3}\tan\theta = 3\sin\theta$

$$\Rightarrow \sqrt{3}\,\frac{\sin\theta}{\cos\theta} = 3\sin\theta$$

$$\Rightarrow \frac{1}{\cos\theta} = \sqrt{3}$$

$$\Rightarrow \cos\theta = \frac{1 \rightarrow B}{\sqrt{3} \rightarrow H}$$

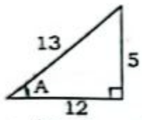
Perpendicular $= \sqrt{2}$

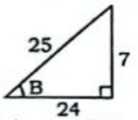
$\therefore \sin^2\theta - \cos^2\theta$

$$= \left(\frac{\sqrt{2}}{\sqrt{3}}\right)^2 - \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{1}{3}$$

34. (b) $\sin A = \frac{5}{13}$

$7 \cot B = 24 \Rightarrow \cot B = \frac{24}{7}$





$\therefore (\sec A \cos B)(\operatorname{cosec} B \tan A)$

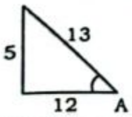
$$= \left(\frac{13}{12}\times\frac{24}{25}\right)\left(\frac{25}{7}\times\frac{5}{12}\right) = \frac{65}{42}$$

35. (c) $\operatorname{cosec}\theta = \frac{5}{3}$

$\therefore (\sec^2\theta - 1) \times \cot^2\theta \times (1 + \cot^2\theta)$
$= \tan^2\theta \times \cot^2\theta \times \operatorname{cosec}^2\theta$

$$= \operatorname{cosec}^2\theta = \frac{25}{9}$$

36. (c) $\sin A = \frac{5}{13}$ (5, 12, 13)

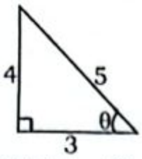


$$\frac{\cos A - 2\tan A}{\sin A + 3\tan A}$$

$$= \frac{\frac{12}{13} - 2\times\frac{5}{12}}{\frac{5}{13} + 3\times\frac{5}{12}} = \frac{\frac{12}{13} - \frac{5}{6}}{\frac{5}{13} + \frac{5}{4}}$$

$$= \frac{\frac{7}{78}}{\frac{85}{52}} = \frac{7\times52}{78\times85} = \frac{14}{255}$$

37. (d) $\cot\theta = \frac{3}{4}\begin{matrix}\rightarrow \text{Base} \\ \rightarrow \text{Perpendicular}\end{matrix}$

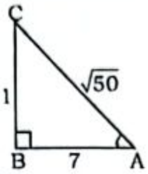


Triplet → (3, 4, 5)

$\therefore \sin\theta + \cos\theta - \tan\theta$

$$= \frac{4}{5} + \frac{3}{5} - \frac{4}{3} = \frac{12+9-20}{15} = \frac{1}{15}$$

38. (a) $\cot A = 7$



By pythagoras theorem,

$AC = \sqrt{7^2+1^2} = \sqrt{50}$

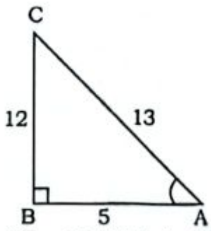
$$\therefore \frac{5\cos A + 4\sin A}{\cos^3 A + 7\sin^3 A + 6\sin A}$$

$$= \frac{5\times\frac{7}{\sqrt{50}} + 4\times\frac{1}{\sqrt{50}}}{\left(\frac{7}{\sqrt{50}}\right)^3 + 7\left(\frac{1}{\sqrt{50}}\right)^3 + 6\times\frac{1}{\sqrt{50}}}$$

$$= \frac{\frac{39}{\sqrt{50}}}{\left(\frac{343}{50\sqrt{50}}\right) + \left(\frac{7}{50\sqrt{50}}\right) + \frac{6}{\sqrt{50}}}$$

$$= \frac{\frac{39}{\sqrt{50}}}{\frac{650}{50\sqrt{50}}} = 3$$

39. (c) $\cot A = \frac{5}{12}$



AC = 13 (triplet of 5, 12, 13)

$$\therefore \frac{\sqrt{\sec A - \operatorname{cosec} A}}{\sqrt{\sec A + \operatorname{cosec} A}} = \sqrt{\frac{17}{7}}$$

$$= \frac{\sqrt{\frac{13}{5} - \frac{13}{12}}}{\sqrt{\frac{13}{5} + \frac{13}{12}}} - \sqrt{\frac{17}{7}} = \frac{\sqrt{\frac{1}{5} - \frac{1}{12}}}{\sqrt{\frac{1}{5} + \frac{1}{12}}} - \sqrt{\frac{17}{7}}$$

$$= \frac{\sqrt{\frac{12-5}{60}}}{\sqrt{\frac{12+5}{60}}} - \sqrt{\frac{17}{7}} = \frac{\sqrt{7}}{\sqrt{17}} - \frac{\sqrt{17}}{\sqrt{7}}$$

$$= \frac{7-17}{\sqrt{119}} = \frac{-10}{\sqrt{119}}$$

Alternate Method:

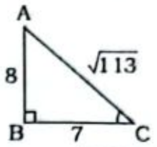
$$\cot A = \frac{\operatorname{cosec} A}{\sec A} = \frac{5}{12}$$

$$\therefore \frac{\sqrt{\sec A - \operatorname{cosec} A}}{\sqrt{\sec A + \operatorname{cosec} A}} - \sqrt{\frac{17}{7}}$$

$$= \frac{\sqrt{12-5}}{\sqrt{12+5}} - \frac{\sqrt{17}}{\sqrt{7}} = \frac{\sqrt{7}}{\sqrt{17}} - \frac{\sqrt{17}}{\sqrt{7}}$$

$$= \frac{-10}{\sqrt{119}}$$

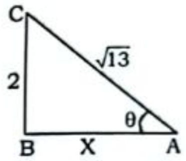
40. (a) $\cot\theta = \frac{7}{8}$



$AC = \sqrt{8^2+7^2} = \sqrt{113}$

$$\therefore \frac{1+\sin\theta}{\cos\theta} = \frac{1+\frac{8}{\sqrt{113}}}{\frac{7}{\sqrt{113}}} = \frac{8+\sqrt{113}}{7}$$

41. (a) $\sqrt{13}\sin\theta = 2 \Rightarrow \sin\theta = \frac{2}{\sqrt{13}}$

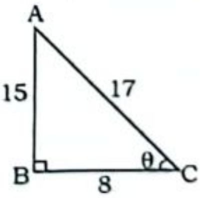


Base (X) $= \sqrt{13-4} = 3$

$$\therefore \frac{3\tan\theta + \sqrt{13}\sin\theta}{\sqrt{13}\cos\theta - 3\tan\theta}$$

$$= \frac{3\times\frac{2}{3} + \sqrt{13}\times\frac{2}{\sqrt{13}}}{\sqrt{13}\times\frac{3}{\sqrt{13}} - 3\times\frac{2}{3}} = \frac{2+2}{3-2} = 4$$

42. (a)



$$\sin\theta = \frac{15 \rightarrow \text{Perpendicular}}{17 \rightarrow \text{Hypotenuse}}$$

Base (BC) = 8 (with triplet of 8,15,17)

$$\therefore \frac{15\cot\theta + 17\sin\theta}{8\tan\theta + 16\sec\theta}$$

$$= \frac{15\times\frac{8}{15} + 17\times\frac{15}{17}}{8\times\frac{15}{8} + 16\times\frac{17}{8}} = \frac{8+15}{15+34} = \frac{23}{49}$$

43. (a) $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{7}{4}$

$$\therefore \frac{4\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta} = \frac{4\times7 - 3\times4}{4\times7 + 3\times4}$$

$$= \frac{16}{40} = \frac{2}{5}$$

44. (c) Given, $\tan x = \frac{7}{5}$

$\Rightarrow \frac{\sin x}{\cos x} = \frac{7}{5}$

$\therefore \frac{9\sin x - \frac{42}{5}\cos x}{15\sin x + 21\cos x}$

$= \frac{9\times7 - \frac{42}{5}\times5}{15\times7 + 21\times5} = \frac{63-42}{105+105}$

$= \frac{21}{210} = 0.1$

45. (c) Given, $3\cot A = \frac{7}{3}$

$\Rightarrow \cot A = \frac{7}{9} \Rightarrow \frac{\cos A}{\sin A} = \frac{7}{9}$

$\therefore \frac{3\cos A + 2\sin A}{3\cos A - 2\sin A}$

$= \frac{3\times7 + 2\times9}{3\times7 - 2\times9} = \frac{39}{3} = 13$

46. (a) $3\tan\theta = 4 \Rightarrow \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{4}{3}$

$\therefore \frac{9\sin\theta + 2\cos\theta}{9\sin\theta - 2\cos\theta} = \frac{9\times4 + 2\times3}{9\times4 - 2\times3}$

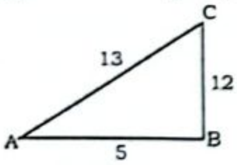
$= \frac{42}{30} = \frac{7}{5}$

47. (c) $\tan A = \frac{5}{8} \Rightarrow \frac{\sin A}{\cos A} = \frac{5}{8}$

$\therefore \frac{8\sin A - 7\cos A}{8\sin A + 11\cos A}$

$= \frac{8\times5 - 7\times8}{8\times5 + 11\times8} = \frac{40-56}{40+88} = \frac{-16}{128} = \frac{-1}{8}$

48. (d) We know triplet (5, 12, 13)



$\cot A = \frac{5}{12}, \tan A = \frac{12}{5}$

$\therefore \frac{5\times\sin^2 A}{6\times\cos^2 A} = \frac{5}{6}\times\tan^2 A$

$= \frac{5}{6}\times\frac{12}{5}\times\frac{12}{5} = \frac{24}{5}$

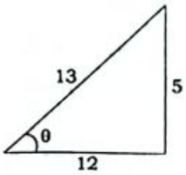
49. (c) $2\cot\theta = 3$

$\Rightarrow \cot\theta = \frac{3 \to B}{2 \to P}, H = \sqrt{2^2+3^2} = \sqrt{13}$

$\therefore \frac{\sqrt{13}\sin\theta - 3\tan\theta}{3\tan\theta + \sqrt{13}\cos\theta}$

$= \frac{\sqrt{13}\times\frac{2}{\sqrt{13}} - 3\times\frac{2}{3}}{3\times\frac{2}{3} - \sqrt{13}\times\frac{3}{13}} = 0$

50. (b) $\cos\theta = \frac{12}{13}$



$\therefore \frac{\sin\theta(1-\tan\theta)}{\tan\theta(1+\operatorname{cosec}\theta)} = \frac{\frac{5}{13}\left(1-\frac{5}{12}\right)}{\frac{5}{12}\left(1+\frac{13}{5}\right)}$

$= \frac{\frac{5}{13}\times\left(\frac{7}{12}\right)}{\frac{5}{12}\times\frac{18}{5}} = \frac{35}{234}$

51. (a) $\sin A = \frac{1}{2} \Rightarrow A = 30°$

$\therefore \frac{\tan A - \cot A}{\sqrt{3}(1+\operatorname{cosec} A)}$

$= \frac{\frac{1}{\sqrt{3}} - \sqrt{3}}{\sqrt{3}(1+2)} = \frac{-2}{\sqrt{3}}\times\frac{1}{3\sqrt{3}} = \frac{-2}{3(3)} = \frac{-2}{9}$

52. (d) Given,

$2\tan\theta = 3 \Rightarrow \tan\theta = \frac{3}{2}$

$\Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{3}{2}$

$\therefore \frac{3\sin\theta - 2\cos\theta}{3\sin\theta + 2\cos\theta} = \frac{3\times3 - 2\times2}{3\times3 + 2\times2}$

$= \frac{9-4}{9+4} = \frac{5}{13}$

53. (a) $7\tan\theta = 3 \Rightarrow \tan\theta = \frac{3}{7}$

$\Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{3}{7}$

$\therefore \frac{5\sin\theta - \cos\theta}{5\sin\theta + 2\cos\theta} = \frac{5\times3 - 7}{5\times3 + 2\times7}$

$= \frac{8}{29}$

54. (c) $7\tan\theta = 3$

$\Rightarrow \tan\theta = \frac{3}{7} \Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{3}{7}$

$\therefore \frac{7\sin\theta + 5\cos\theta}{7\sin\theta - 2\cos\theta} = \frac{7\times3 + 5\times7}{7\times3 - 7\times2}$

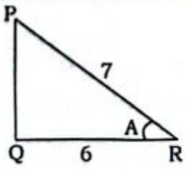
$= \frac{56}{7} = 8$

55. (c) $7\cos A = 6 \Rightarrow \cos A = \frac{6}{7}$

$\therefore \frac{\operatorname{cosec} A + \cot A}{\operatorname{cosec} A - \cot A} = \frac{\frac{1}{\sin A} + \frac{\cos A}{\sin A}}{\frac{1}{\sin A} - \frac{\cos A}{\sin A}}$

$= \frac{1+\cos A}{1-\cos A} = \frac{1+\frac{6}{7}}{1-\frac{6}{7}} = \frac{13}{1} = 13$

Alternate Method:



$PQ = \sqrt{7^2 - 6^2} = \sqrt{13}$

$\therefore \frac{\operatorname{cosec} A + \cot A}{\operatorname{cosec} A - \cot A}$

$= \frac{7+6}{7-6} = \frac{13}{1} = 13$

56. (a) Given,

$\tan A = \frac{5}{7} \Rightarrow \frac{\sin A}{\cos A} = \frac{5}{7}$

$\therefore \frac{7\sin A - 3\cos A}{7\sin A + 3\cos A} + 4$

$= \frac{7\times5 - 3\times7}{7\times5 + 3\times7} + 4 = \frac{14}{56} + 4$

$= \frac{1}{4} + 4 = 4\frac{1}{4}$

57. (d) $\sin\theta = \frac{5}{13} = \frac{P}{h}$

We have triplet (5, 12, 13)
b = 12

$\therefore \frac{\cos^2\theta - \sin^2\theta}{2\cos\theta\sin\theta}$

$= \frac{\left(\frac{12}{13}\right)^2 - \left(\frac{5}{13}\right)^2}{2\times\frac{12}{13}\times\frac{5}{13}} = \frac{\frac{144}{169} - \frac{25}{169}}{\frac{120}{169}}$

$= \frac{\frac{119}{169}}{\frac{120}{169}} = \frac{119}{120}$

58. (b) $\frac{7\sin\theta + 4\cos\theta}{9\sin\theta - 2\cos\theta} = \frac{5}{4}$

$\Rightarrow 28\sin\theta + 16\cos\theta = 45\sin\theta - 10\cos\theta$

$\Rightarrow 26\cos\theta = 17\sin\theta$

$\Rightarrow \tan\theta = \frac{26}{17}$

$\therefore \frac{\tan^2\theta + 5}{\tan^2\theta - 5} = \frac{\left(\frac{26}{17}\right)^2 + 5}{\left(\frac{26}{17}\right)^2 - 5} = -\frac{2121}{769}$

59. (c) $\frac{\sec\alpha + \tan\alpha}{\sec\alpha - \tan\alpha} = \frac{7}{4}$

$\Rightarrow 4\sec\alpha + 4\tan\alpha = 7\sec\alpha - 7\tan\alpha$

$\Rightarrow 11\tan\alpha = 3\sec\alpha$

$\Rightarrow \frac{\tan\alpha}{\sec\alpha} = \frac{3}{11}$

$\Rightarrow \sin\alpha = \frac{3}{11}$

$\therefore \operatorname{cosec}\alpha = \frac{11}{3}$

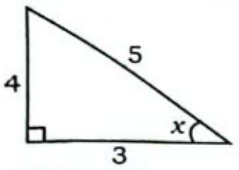
Alternate Method:-

By using componendo and dividendo

$\frac{\sec\alpha}{\tan\alpha} = \frac{11}{3}$

$\Rightarrow \operatorname{cosec}\alpha = \frac{11}{3}$

60. (b) $\text{cosec}x = \frac{5 \to H}{4 \to P}$



$\Rightarrow$ Base = 3
(3, 4, 5 are triplet)

$\therefore \frac{5\sin^2 x + 8\cot^2 x}{27\tan^2 x - 125\cos^2 x}$

$= \frac{5 \times \frac{16}{25} + 8 \times \frac{9}{16}}{27 \times \frac{16}{9} - 125 \times \frac{9}{25}} = \frac{\frac{16}{5} + \frac{9}{2}}{48 - 45}$

$= \frac{3.2 + 4.5}{3} = \frac{7.7}{3} = \frac{77}{30}$

61. (b) $\cot\theta = \frac{\sqrt{11}}{1} \Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{\sqrt{11}}{1}$

$\therefore \frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2 + \sec^2\theta}$

$= \frac{\frac{1}{\sin^2\theta} - \frac{1}{\cos^2\theta}}{\frac{1}{\sin^2\theta} + \frac{1}{\cos^2\theta}} = \frac{\cos^2\theta - \sin^2\theta}{\cos^2\theta + \sin^2\theta}$

$= \frac{11 - 1}{11 + 1} = \frac{10}{12} = \frac{5}{6}$

62. (c) $\frac{2\sin A - \cos A}{\sin A + \cos A} = 1$

$\Rightarrow 2\sin A - \cos A = \sin A + \cos A$

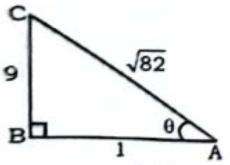
$\Rightarrow \sin A = 2\cos A \Rightarrow \tan A = 2$

$\therefore \cot A = \frac{1}{2}$

63. (c) $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} = \frac{4}{5}$,

$\Rightarrow 5\sin\theta - 5\cos\theta = 4\sin\theta + 4\cos\theta$

$\Rightarrow \sin\theta = 9\cos\theta \Rightarrow \tan\theta = \frac{9}{1}$



$\text{cosec}\theta = \frac{\sqrt{82}}{9}$

$\therefore \frac{\text{cosec}^2\theta}{2 - \text{cosec}^2\theta} = \frac{\frac{82}{81}}{2 - \frac{82}{81}} = \frac{\frac{82}{81}}{\frac{80}{81}} = \frac{82}{80} = \frac{41}{40}$

64. (a) $\frac{\cos\beta}{\sec\alpha} = 15, \frac{\sin\beta}{\sec\alpha} = 16$

$\Rightarrow \frac{\frac{\cos\beta}{\sec\alpha}}{\frac{\sin\beta}{\sec\alpha}} = \frac{15}{16}$

$\cot\beta = \frac{15 \to B}{16 \to P}$

$\therefore H = \sqrt{16^2 + 15^2} = \sqrt{481}$

$\sin^2\beta = \left(\frac{P}{H}\right)^2 = \left(\frac{16}{\sqrt{481}}\right)^2 = \frac{256}{481}$

65. (a) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{5}{1}$

By componendo and dividendo

$\frac{\sin\theta}{\cos\theta} = \frac{6}{4} = \frac{3}{2} \Rightarrow \tan\theta = \frac{3}{2}$

$H = \sqrt{9 + 4} = \sqrt{13}$

$\therefore \sin\theta = \frac{3}{\sqrt{13}}, \cos\theta = \frac{2}{\sqrt{13}}$

$\therefore \frac{4\sin^2\theta + 3}{2\cos^2\theta + 2} = \frac{4 \times \frac{9}{13} + 3}{2 \times \frac{4}{13} + 2} = \frac{\frac{36}{13} + 3}{\frac{8}{13} + 2} = \frac{75}{34}$

66. (d) $\frac{\sec A + \tan A}{\sec A - \tan A} = \frac{209}{79}$

using C & D rule

$\Rightarrow \frac{\sec A}{\tan A} = \frac{288}{130}$

$\Rightarrow \frac{\cos A}{\cos A \times \sin A} = \frac{144}{65}$

$\Rightarrow \frac{1}{\sin A} = \frac{144}{65} \Rightarrow \sin A = \frac{65}{144}$

67. (c) $\frac{21\cos A + 3\sin A}{3\cos A + 4\sin A} = 2$

Divide N^r & D^r by sinA

$\Rightarrow \frac{21\cot A + 3}{3\cot A + 4} = 2$

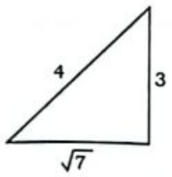
$\Rightarrow 21\cot A + 3 = 6\cot A + 8$

$\Rightarrow 15\cot A = 5 \Rightarrow \cot A = \frac{1}{3}$

68. (a) $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{1}{7}$

By C and D rule,

$\Rightarrow \frac{\sec\theta}{\tan\theta} = \frac{8}{6} = \frac{4}{3} \Rightarrow \frac{\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}} = \frac{4}{3} \Rightarrow \text{Sin}\theta = \frac{3}{4}$



$\therefore \frac{\text{cosec}\theta + \cot^2\theta}{\text{cosec}\theta - \cot^2\theta} = \frac{\frac{4}{3} + \left(\frac{\sqrt{7}}{3}\right)^2}{\frac{4}{3} - \left(\frac{\sqrt{7}}{3}\right)^2}$

$= \frac{\frac{4}{3} + \frac{7}{9}}{\frac{4}{3} - \frac{7}{9}} = \frac{\frac{19}{9}}{\frac{5}{9}} = \frac{19}{5}$

69. (a) $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2\frac{51}{79} = \frac{209}{79}$

By C & D,

$\Rightarrow \frac{\sec\theta}{\tan\theta} = \frac{288}{130} = \frac{144}{65}$

$\Rightarrow \frac{\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}} = \frac{144}{65} \Rightarrow \sin\theta = \frac{65}{144}$

70. (c) $\tan\theta = \frac{3}{10} \Rightarrow \cot\theta = \frac{10}{3}$

$\therefore \frac{(1 + \sin\theta)(1 - \sin\theta)}{(1 + \cos\theta)(1 - \cos\theta)}$

$= \frac{(1 - \sin^2\theta)}{(1 - \cos^2\theta)} = \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta = \left(\frac{10}{3}\right)^2 = \frac{100}{9}$

71. (a) Given, $\cot\theta = \frac{4}{3}$

$\therefore \frac{\sec\theta(1 + \cot^2\theta)(\text{cosec}^2\theta - \cot^2\theta)}{\text{cosec}^3\theta}$

$= \frac{\sec\theta \times \text{cosec}^2\theta \times 1}{\text{cosec}^3\theta} = \frac{\sec\theta}{\text{cosec}\theta}$

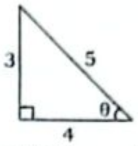
$= \tan\theta = \frac{1}{\cot\theta} = \frac{3}{4}$

Note: $1 + \cot^2\theta = \text{cosec}^2\theta$

Alternate Method:-

Given,

$\cot\theta = \frac{4}{3} \Rightarrow$



$\therefore \frac{\sec\theta(1 + \cot^2\theta)(\text{cosec}^2\theta - \cot^2\theta)}{\text{cosec}^3\theta}$

$= \frac{5}{4} \times \frac{\left(1 + \frac{16}{9}\right)\left(\frac{25}{9} - \frac{16}{9}\right)}{\frac{25}{9} \times \frac{5}{3}}$

$= \frac{5}{4} \times \frac{25}{9} \times 1 \times \frac{9}{25} \times \frac{3}{5}$

$= \frac{5}{4} \times \frac{3}{5} = \frac{3}{4}$

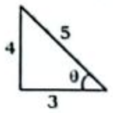
72. (b) $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{1}{9}$

$\frac{1 - \sin\theta}{1 + \sin\theta} = \frac{1}{9}$

$9 - 9\sin\theta = 1 + \sin\theta$

$10\sin\theta = 8$

$\sin\theta = \frac{4}{5}$



$\frac{\sin\theta - \tan^2\theta}{\sin\theta + \tan^2\theta} = \frac{\frac{4}{5} - \left(\frac{4}{3}\right)^2}{\frac{4}{5} + \left(\frac{4}{3}\right)^2} = \frac{\frac{4}{5} - \frac{16}{9}}{\frac{4}{5} + \frac{16}{9}}$

$= -\frac{11}{29}$

Alternate Method:

$\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{1}{9}$

$\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{9}{1}$

by C & D Rule

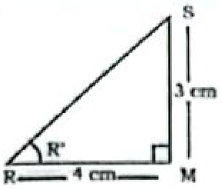
$\frac{\sec\theta}{\tan\theta} = \frac{10}{8} = \frac{5}{4}$

$\text{cosec}\theta = \frac{5}{4}$ than, $\sin\theta = \frac{4}{5}$

$\frac{\sin\theta - \tan^2\theta}{\sin\theta + \tan^2\theta} = \frac{\frac{4}{5} - \left(\frac{4}{3}\right)^2}{\frac{4}{5} + \left(\frac{4}{3}\right)^2} = \frac{\frac{4}{5} - \frac{16}{9}}{\frac{4}{5} + \frac{16}{9}}$

$= -\frac{11}{29}$

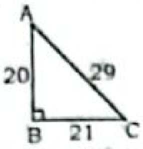
73. (b)



$\because$ SR = $\sqrt{4^2 + 3^2}$ = 5 cm

secR = $\frac{\text{Hypotenuse}}{\text{Base}} = \frac{5}{4}$

74. (c)



We have triplet (20, 21, 29)

cotcC + cosecC − 2tanA

$= \frac{21}{20} + \frac{29}{20} - 2 \times \frac{21}{20} = \frac{8}{20} = \frac{2}{5}$

75. (a) Given, ∠B = 90°

Then, remaining angles ∠A + ∠C = 90°

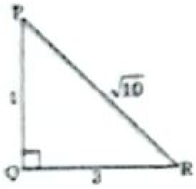
So, $\frac{\sin A}{\cos C} = 1$ & cotA = $\frac{\cos A \rightarrow 1}{\sin A \rightarrow 2}$

$\therefore \frac{\sin A(\cos C + \cos A)}{\cos C(\sin C - \sin A)}$

$= \frac{\cos(90 - A) + \cos A}{\sin(90 - A) - \sin A} = \frac{\sin A + \cos A}{\cos A - \sin A}$

$= \frac{1+2}{1-2} = \frac{3}{-1} = -3$

76. (d)



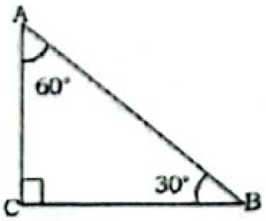
PR = $\sqrt{3^2 + 1} = \sqrt{10}$

$\frac{\sec P(\cos R + \sin P)}{\text{cosec}R(\sin R - \text{cosec}P)}$

$= \frac{\frac{\sqrt{10}}{1}\left(\frac{3}{\sqrt{10}} + \frac{3}{\sqrt{10}}\right)}{\frac{\sqrt{10}}{1}\left(\frac{1}{\sqrt{10}} - \frac{\sqrt{10}}{3}\right)}$

$= \frac{\frac{6}{\sqrt{10}}}{\frac{-7}{3\sqrt{10}}} = \frac{6}{\sqrt{10}} \times \frac{3\sqrt{10}}{-7} = \frac{-18}{7}$

77. (c)



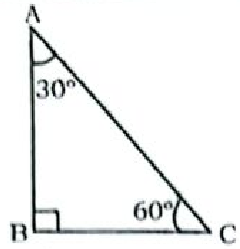
tan A = $\sqrt{3}$

⇒ A = 60°

$\because$ cot (A + B) = cot 90° = 0

$\therefore$ sinA cosB cot (A + B) = 0

78. (d)



sinA = $\frac{1}{2}$ ⇒ A = 30°

So, ∠C = 60°, then cos60° = $\frac{1}{2}$

Alternate Method:

Here, ∠B = 90°

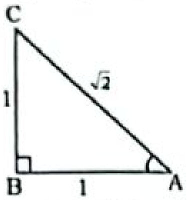
So, ∠A + ∠C = 90°

Then, sinA = cosC = $\frac{1}{2}$

Note: sinα = cosβ

When, α + β = 90°

79. (b)



tanA = 1 ⇒ AC = $\sqrt{2}$

$\therefore$ 4 sinA cosA = 4 × $\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$ = 2

Alternate Method:

tanA = 1 ⇒ A = 45°

$\therefore$ 4sinA cosA = 4sin45° cos45°

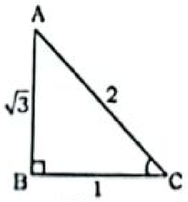
= 4 × $\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$ = 2

Alternate Method:

A = 45°

4 sinA.cosA = 2sin2A = 2sin90° = 2

80. (a)



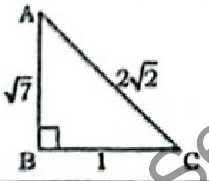
tanC = $\frac{\sqrt{3}}{1}$

$\therefore \frac{\sin^2 C + \cos^2 C}{1 + \cot^2 C} = \frac{\frac{3}{4} + \frac{1}{4}}{1 + \frac{1}{3}} \Rightarrow \frac{1}{\frac{4}{3}} = \frac{3}{4}$

Alternate Method:

$\frac{\sin^2 C + \cos^2 C}{1 + \cot^2 C} = \frac{1}{\text{cosec}^2 C} \Rightarrow \sin^2 C = \frac{3}{4}$

81. (c) cosecA = $\frac{2\sqrt{2} \rightarrow H}{1 \rightarrow P}$



$\therefore$ sinA cosC + cosA sinC

$= \frac{1}{2\sqrt{2}} \times \frac{1}{2\sqrt{2}} + \frac{\sqrt{7}}{2\sqrt{2}} \times \frac{\sqrt{7}}{2\sqrt{2}}$

$= \frac{1}{8} + \frac{7}{8} = \frac{8}{8} = 1$

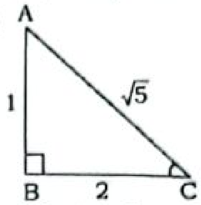
Alternate Method:

∠B = 90°, ∠A + ∠C = 180° − 90° = 90°

$\therefore$ sinA cosC + cosA sinC

= sin(A + C) = sin90° = 1

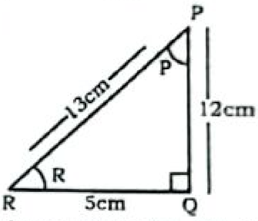
82. (d)



$\therefore$ cosA + tan C

$= \frac{1}{\sqrt{5}} + \frac{1}{2} = \frac{2 + \sqrt{5}}{2\sqrt{5}}$

83. (c)

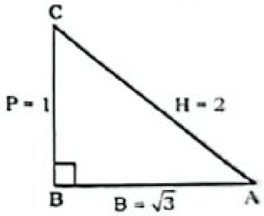


We know triplet (5, 12, 13)

RQ = 5 cm

$\therefore$ tan P + cot R = $\frac{5}{12} + \frac{5}{12} = \frac{10}{12}$

84. (a)



$\therefore$ sinAcosC + cosAsinC

$= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

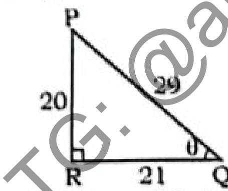
$= \frac{1+3}{4} = 1$

Alternate Method:

sinA cosC + cosA sinC = sin(A + C)

= sin90° = 1

85. (d)



Triplet ⇒ (20, 21, 29)

Then,

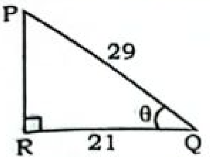
$\cos^2\theta - \sin^2\theta$

$= (\cos\theta + \sin)(\cos\theta - \sin\theta)$

$= \left(\frac{21}{29} + \frac{20}{29}\right)\left(\frac{21}{29} - \frac{20}{29}\right)$

$= \frac{41}{29} \times \frac{1}{29} = \frac{41}{841}$

Alternate Method:



$\therefore \cos^2\theta - \sin^2\theta$

$= \cos^2\theta - (1 - \cos^2\theta)$

$= 2\cos^2\theta - 1$

$= 2 \times \left(\frac{21}{29}\right)^2 - 1 = 2 \times \frac{441}{841} - 1$

$= \frac{882 - 841}{841} = \frac{41}{841}$

86. (b) $\sec 31° = x$

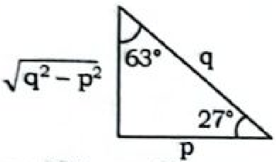
$\therefore \sin^2 59° + \frac{1}{\sec^2 31°} - \frac{1}{\sin^2 59° \operatorname{cosec}^2 59°}$

$= \sin^2 59° + \cos^2 31° - 1$

$= 2\cos^2 31° - 1$

$= \frac{2}{\sec^2 31°} - 1 = \frac{2}{x^2} - 1 = \frac{2 - x^2}{x^2}$

87. (b)



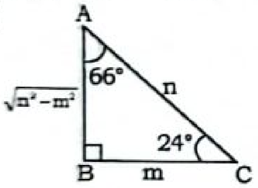
$\operatorname{cosec} 27° - \cos 63°$

$= \operatorname{cosec} 27° - \sin 27°$

$= \frac{q}{\sqrt{q^2 - p^2}} - \frac{\sqrt{q^2 - p^2}}{q}$

$= \frac{q^2 - q^2 + p^2}{q\sqrt{q^2 - p^2}} = \frac{p^2}{q\sqrt{q^2 - p^2}}$

88. (d)



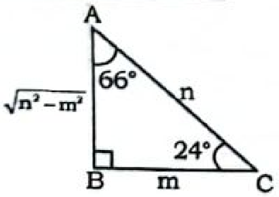
$\text{Cos}24° = \frac{m}{n} \Rightarrow AB = \sqrt{n^2 - m^2}$

$\therefore \text{Cosec}24° - \text{Cos}66°$

$= \frac{n}{\sqrt{n^2 - m^2}} - \frac{\sqrt{n^2 - m^2}}{n}$

$= \frac{n^2 - n^2 + m^2}{n\sqrt{n^2 - m^2}} = \frac{m^2}{n\sqrt{n^2 - m^2}}$

Alternate Method:



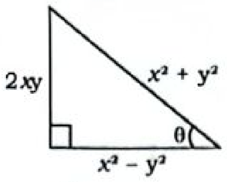
$\cos 24° = \frac{m}{n}$

$\therefore \operatorname{cosec}24° - \cos 66° = \operatorname{cosec}24° - \sin 24°$

$= \frac{1}{\sin 24°} - \sin 24° = \frac{\cos^2 24°}{\sin 24°}$

$= \frac{\frac{m^2}{n^2}}{\frac{\sqrt{n^2 - m^2}}{n}} = \frac{m^2}{n\sqrt{n^2 - m^2}}$

89. (a)



$\sin\theta = \frac{2xy}{x^2 + y^2}$

$\text{Base} = x^2 - y^2$

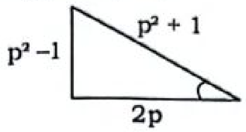
$\therefore \tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{2xy}{x^2 - y^2}$

90. (c) $\cot A = \frac{B}{P} = \frac{2p}{p^2 - 1}$

$\text{Hypotenuse} = \sqrt{(2p)^2 + (p^2 - 1)^2}$

$= \sqrt{4p^2 + p^4 + 1 - 2p^2} = \sqrt{2p^2 + p^4 + 1}$

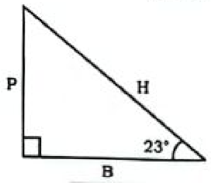
$= \sqrt{(p^2 + 1)^2} = p^2 + 1$



$\operatorname{cosec}A = \frac{p^2 + 1}{p^2 - 1}$

Note:- $2p$, $p^2 - 1$ & $p^2 + 1$ are triplet.

91. (d) $\sin 23° = \frac{a \to P}{b \to H}$



$B = \sqrt{b^2 - a^2}$

We know, $[\sin(90° - \theta) = \cos\theta]$

$\therefore \sec 23° - \sin 67° = \sec 23° - \cos 23°$

$= \frac{b}{\sqrt{b^2 - a^2}} - \frac{\sqrt{b^2 - a^2}}{b} = \frac{a^2}{b\sqrt{b^2 - a^2}}$

92. (d) $\cos 48° = \frac{m \to B}{n \to H}$

$P = \sqrt{n^2 - m^2}$

Now,

$\sec 48° - \cot 42°$

$= \sec 48° - \cot(90° - 48°)$

$= \sec 48° - \tan 48°$

$= \frac{n}{m} - \frac{\sqrt{n^2 - m^2}}{m}$

$= \frac{n - \sqrt{n^2 - m^2}}{m}$

Alternate Method:

Let $\cos 48° = \frac{4 \to m}{5 \to n}$

$$\text{tiplet } \begin{matrix} (3, & 4, & 5) \\ \downarrow & \downarrow & \downarrow \\ P & B & H \end{matrix}$$

$\sec 48° - \cot 42° = \sec 48° - \tan 48°$

$= \frac{5}{4} - \frac{3}{4} = \frac{2}{4} = \frac{1}{2}$

Go through option - (d)

$\frac{n - \sqrt{n^2 - m^2}}{m} = \frac{5 - \sqrt{25 - 16}}{4}$

$= \frac{5 - 3}{4} = \frac{1}{2}$ (satisfied)

93. (a) $\cos 53° = \frac{x}{y}$

So, $\sec 53° = \frac{y}{x}$

$\sec 53° = \sec(90° - 37°)$

$= \operatorname{cosec} 37°$

$\text{Cot}37° = \sqrt{\operatorname{cosec}^2 37° - 1} = \sqrt{\left(\frac{y}{x}\right)^2 - 1}$

$= \sqrt{\frac{y^2 - x^2}{x^2}} = \frac{\sqrt{y^2 - x^2}}{x}$

$\therefore \sec 53° + \cot 37°$

$= \frac{y}{x} + \frac{\sqrt{y^2 - x^2}}{x} = \frac{y + \sqrt{y^2 - x^2}}{x}$

SMART APPROACH:-

$\cos 53° = \frac{x — B}{y — H}$

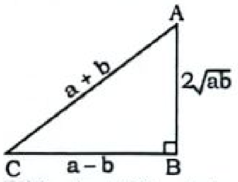
$P = \sqrt{y^2 - x^2}$

$\therefore \sec 53° + \cot 37°$
$= \sec 53° + \tan 53°$

$= \frac{y}{x} + \frac{\sqrt{y^2 - x^2}}{x}$

$= \frac{y + \sqrt{y^2 - x^2}}{x}$

94. (a) $\sin\theta = \frac{2\sqrt{ab}}{a + b}$



$BC^2 = (a + b)^2 - 4ab$

$\Rightarrow BC^2 = a^2 + b^2 + 2ab - 4ab$

$\Rightarrow BC = a - b$

$\therefore \frac{\cos\theta + 1}{\cos\theta - 1} = \frac{\frac{a - b}{a + b} + 1}{\frac{a - b}{a + b} - 1} = -\frac{a}{b}$

Alternate Method:

Let, $a = 4$, $b = 1$

Then $\sin\theta = \frac{4 \to P}{5 \to H}$

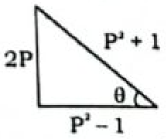
$$\text{by triplet } \begin{matrix} (3, & 4, & 5) \\ \downarrow & \downarrow & \downarrow \\ B & P & H \end{matrix}$$

$\cos\theta = \frac{3}{5}$

$\frac{\cos\theta + 1}{\cos\theta - 1} = \frac{\frac{3}{5} + 1}{\frac{3}{5} - 1} = \frac{\frac{8}{5}}{\frac{-2}{5}} = -4$

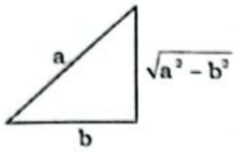
by option, $\frac{-a}{b} = \frac{-4}{1} = -4$ (satisfied)

95. (b) $\cos\theta = \frac{P^2 - 1}{P^2 + 1}$



$\therefore \operatorname{cosec}\theta = \frac{P^2 + 1}{2P}$

96. (c)



$\sec\theta = \frac{a}{b}$

$\frac{1-\tan^2\theta}{2-\sin^2\theta} = \frac{1-\left(\frac{\sqrt{a^2-b^2}}{b}\right)^2}{2-\left(\frac{\sqrt{a^2-b^2}}{a}\right)^2}$

$= \frac{\frac{b^2-a^2+b^2}{b^2}}{\frac{2a^2-a^2+b^2}{a^2}} = \frac{\frac{2b^2-a^2}{b^2}}{\frac{a^2+b^2}{a^2}}$

$= \frac{a^2\left(2b^2-a^2\right)}{b^2\left(a^2+b^2\right)}$

Alternate Method:-

I. $\sec\theta = \frac{a}{b}$

Put $\theta = 60°$

$\sec 60° = \frac{2}{1} = \frac{a \to H}{b \to B}$

$P = \sqrt{2^2-1^2} = \sqrt{3}$

$\frac{1-\tan^2\theta}{2-\sin^2\theta} = \frac{1-3}{2-\frac{3}{4}} = \frac{-2}{5} \times 4 = \frac{-8}{5}$

Go through option,

$\frac{a^2(2b^2-a^2)}{b^2(a^2+b^2)} = \frac{4(2-4)}{1(4+1)} = \frac{4\times(-2)}{5} = \frac{-8}{5}$

II. $\sec\theta = \frac{a}{b}$

with the help of triplet 3, 4, 5 (P, B, H)

$\sec\theta = \frac{H}{B} = \frac{5}{4} = \frac{a}{b}$

Let a = 5, b = 4

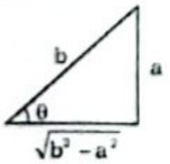
$\therefore \frac{1-\tan^2\theta}{2-\sin^2\theta} = \frac{1-\frac{9}{16}}{2-\frac{9}{25}} = \frac{7}{16}\times\frac{25}{41} = \frac{175}{656}$

Go through option,

$\frac{a^2(2b^2-a^2)}{b^2(a^2+b^2)} = \frac{25(32-25)}{16(25+11)} = \frac{25\times 7}{16\times 41}$

$= \frac{175}{656}$

97. (a)



$\operatorname{cosec}\theta = \frac{b}{a}$

$\frac{\sqrt{3}\cot\theta+1}{\tan\theta+\sqrt{3}} = \frac{\sqrt{3}\left(\frac{\sqrt{b^2-a^2}}{a}\right)+1}{\frac{a}{\sqrt{b^2-a^2}}+\sqrt{3}}$

$= \frac{\frac{\sqrt{3}\left(\sqrt{b^2-a^2}\right)+a}{a}}{\frac{a+\sqrt{3}\left(\sqrt{b^2-a^2}\right)}{\sqrt{b^2-a^2}}} = \frac{\sqrt{b^2-a^2}}{a}$

Alternate Method:-

Put $\theta = 45°$

$\operatorname{cosec} 45° = \frac{b}{a} \Rightarrow \frac{\sqrt{2} \to H}{1 \to P}$

$B = \sqrt{(\sqrt{2})^2-1^2} = 1$

$\therefore \frac{\sqrt{3}\cot\theta+1}{\tan\theta+\sqrt{3}} = \frac{\sqrt{3}+1}{\sqrt{3}+1} = 1$

Go through option,

$\frac{\sqrt{b^2-a^2}}{a} = \frac{\sqrt{(\sqrt{2})^2-1}}{1} = 1$

98. (a) $\frac{5}{\sqrt{3}} - \operatorname{cosec}60°$

$= \frac{5}{\sqrt{3}} - \frac{2}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

99. (c) $\frac{\sin 60° - \cos 60°}{\sin 60° + \cos 60°} = \frac{\frac{\sqrt{3}}{2}-\frac{1}{2}}{\frac{\sqrt{3}}{2}+\frac{1}{2}} = \frac{\sqrt{3}-1}{\sqrt{3}+1}$

$= 2-\sqrt{3}$

100. (a) $\sin(30°+\theta) - \cos(60°-\theta)$

Put, $\theta = 0°$

$\Rightarrow \sin 30° - \cos 60° = \frac{1}{2} - \frac{1}{2} = 0$

101. (a) $\frac{4}{3}\tan^2 45° + 3\cos^2 30° - 2\sec^2 30° - \frac{3}{4}\cot^2 60°$

$= \frac{4}{3}\times 1 + 3\times\frac{3}{4} - 2\times\frac{4}{3} - \frac{3}{4}\times\frac{1}{3}$

$= \frac{4}{3} + \frac{9}{4} - \frac{8}{3} - \frac{1}{4}$

$= \frac{16+27-35}{12} = \frac{8}{12} = \frac{2}{3}$

102. (c) $\frac{2}{3}\tan^2 60° + 3\cos^2 30° - 2\sec^2 30° - \frac{3}{4}\cot^2 60°$

$= \frac{2}{3}\times\left(\sqrt{3}\right)^2 + 3\times\left(\frac{\sqrt{3}}{2}\right)^2 - 2\times\left(\frac{2}{\sqrt{3}}\right)^2 - \frac{3}{4}\times\left(\frac{1}{\sqrt{3}}\right)^2$

$= \frac{2}{3}\times 3 + 3\times\frac{3}{4} - 2\times\frac{4}{3} - \frac{3}{4}\times\frac{1}{3}$

$= 2 + \frac{9}{4} - \frac{8}{3} - \frac{1}{4}$

$= 2 - \frac{8}{3} + 2 = 4 - \frac{8}{3} = \frac{4}{3} = 1.33$

103. (b) $\sec\theta = \sqrt{2} \Rightarrow \theta = 45°$

$\therefore \operatorname{cosec} 45° = \sqrt{2}$

104. (a) $16\cos^3\frac{\pi}{6} - 12\cos\frac{\pi}{6}$ (π = 180°)

$\Rightarrow 16\times\left(\frac{\sqrt{3}}{2}\right)^3 - 12\times\frac{\sqrt{3}}{2}$

$\Rightarrow 6\sqrt{3} - 6\sqrt{3} = 0$

105. (a) $3\tan^2 45° + 2\cos 60° - 2\sin 30°$

$= 3\times 1^2 + 2\times\frac{1}{2} - 2\times\frac{1}{2}$

$= 3 + 1 - 1 = 3$

106. (b) $8\sqrt{3}\sin 30° \tan 60° - 3\cos 0° + 3\sin^2 45° + 2\cos^2 30°$

$= 8\sqrt{3} \times \frac{1}{2} \times \sqrt{3} - 3 \times 1 + 3 \times\left(\frac{1}{\sqrt{2}}\right)^2 + 2\times\left(\frac{\sqrt{3}}{2}\right)^2$

$= 12 - 3 + \frac{3}{2} + \frac{3}{2}$

$= 12 - 3 + 3 = 12$

107. (b) $2k\sin 30°\cos 30°\cot 60°$

$= \frac{\cot^2 30°\sec 60°\tan 45°}{\operatorname{cosec}^2 45°\operatorname{cosec} 30°}$

$\Rightarrow 2k\times\left(\frac{1}{2}\right)\times\left(\frac{\sqrt{3}}{2}\right)\times\frac{1}{\sqrt{3}} = \frac{(\sqrt{3})^2\times 2\times 1}{(\sqrt{2})^2\times 2}$

$\Rightarrow 2k\times\left(\frac{1}{4}\right) = \frac{3\times 2}{2\times 2}$

$\Rightarrow k = \frac{(6\times 2)}{4} = \frac{12}{4} = 3$

108. (a)

$\frac{\frac{4}{3}\tan^2 60 + 3\cos^2 30° - 2\sec^2 30 - \frac{3}{4}\cot^2 60}{\sin 60°.\cos 30° - \cos 60°.\sin 30}$

$= \frac{\frac{4}{3}(\sqrt{3})^2 + 3\times\left(\frac{\sqrt{3}}{2}\right)^2 - 2\times\left(\frac{2}{\sqrt{3}}\right)^2 - \frac{3}{4}\times\left(\frac{1}{\sqrt{3}}\right)^2}{\sin(60°-30°)}$

$= \frac{4 + 3\times\frac{3}{4} - 2\times\frac{4}{3} - \frac{3}{4}\times\frac{1}{3}}{\sin 30°}$

$= \frac{\left(4 + \frac{9}{4} - \frac{8}{3} - \frac{1}{4}\right)}{\frac{1}{2}}$

$= \left(\frac{48+27-32-3}{12}\right)\times 2 = 6\frac{2}{3}$

109. (c) $p\left(\sqrt{3} + \cot 30°\right)$

$= \tan^3 60° - 2\sin 60°$

$\Rightarrow p\left(\sqrt{3}+\sqrt{3}\right) = 3\sqrt{3} - 2\times\frac{\sqrt{3}}{2}$

$\Rightarrow 2\sqrt{3}\,p = \sqrt{3}\,(3-1)$

$\Rightarrow p = 1$

110. (c) $\theta_1 + \theta_2 = \frac{\pi}{2}$

$\because \sin\theta_1 = \sin 30°$

$\Rightarrow \theta_1 = 30° = \frac{\pi}{6} \Rightarrow \theta_2 = 60° = \frac{\pi}{3}$

111. (a) $k(\tan 45° \sin 60°)$

$= \cos 60° \cot 30°$

$\Rightarrow k\left(1\times\frac{\sqrt{3}}{2}\right) = \frac{1}{2}\times\sqrt{3} \Rightarrow k = 1$

112. (d) A.T.Q,

$\cos 0° + \cos 30° - \tan 45° + \operatorname{cosec} 60° + \cot 90°$

$= 1 + \frac{\sqrt{3}}{2} - 1 + \frac{2}{\sqrt{3}} + 0 = \frac{2}{\sqrt{3}} + \frac{\sqrt{3}}{2} = \frac{7}{2\sqrt{3}}$

113. (b) $\sin 60° \sec 30° + \tan 45°.\cos 0° + \sec 60° \sin 30°$

$= \frac{\sqrt{3}}{2}\times\frac{2}{\sqrt{3}} + 1\times 1 + 2\times\frac{1}{2}$

$= 1 + 1 + 1 = 3$

14. (a) If $\theta = 45°$

Then, $\sin 45° = \cos 45° = \frac{1}{\sqrt{2}}$

15. (b) $\frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta + \cos^2\theta}$

Put, $\theta = 45°$

$\frac{\sin^2 45° - 2\sin^4 45°}{2\cos^4 45° + \cos^2 45°}$

$= \frac{\left(\frac{1}{\sqrt{2}}\right)^2 - 2\left(\frac{1}{\sqrt{2}}\right)^4}{2\times\left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^2} = \frac{\frac{1}{2} - \frac{1}{2}}{\frac{1}{2} + \frac{1}{2}} = 0$

16. (c) $\frac{11\sqrt{2}\cos 3A + 10\sin 2A}{7\sqrt{3}\sin 4A}$

$A = 15°$

$\therefore \frac{11\sqrt{2}\cos 45° + 10°\sin 30°}{7\sqrt{3}\sin 60°}$

$= \frac{11\sqrt{2}\times\frac{1}{\sqrt{2}} + 10\times\frac{1}{2}}{7\sqrt{3}\times\frac{\sqrt{3}}{2}}$

$= \frac{11+5}{\frac{21}{2}} = \frac{32}{21}$

17. (a) $\tan\frac{\pi}{6} + \sec\frac{\pi}{6} = x$

$\Rightarrow x = \tan 30° + \sec 30°$

$\Rightarrow x = \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

18. (b) $\frac{\frac{k - k\cot^2 30°}{1 + \cot^2 30°}}{\tan^2 45° - \operatorname{cosec}^2 60°} = \sin^2 60° + 4$

$\Rightarrow \frac{\frac{k(1 - \cot^2 30°)}{1 + \cot^2 30°}}{\tan^2 45° - \operatorname{cosec}^2 60°} = \sin^2 60° + 4$

$\Rightarrow \frac{k(-2)}{4} = \frac{3}{4} + 4 - \frac{4}{3}$

$\Rightarrow k = \left[\frac{9 + 48 - 16}{12}\right]\times(-2)$

$\Rightarrow k = -6.83$

119. (b) $\frac{x - x\operatorname{cosec}^2 30°}{1 + \operatorname{cosec}^2 30°}$

$= \cos^2 60° + 4\cot^2 45° - \sec^2 60°$

$\Rightarrow \frac{x - 4x}{1 + 4} = \frac{1}{4} + 4 - 4$

$\Rightarrow \frac{x - 4x}{1 + 4} = \frac{1}{4} \Rightarrow x - 4x = \frac{5}{4}$

$\Rightarrow -3x = \frac{5}{4} \Rightarrow x = \frac{-5}{12}$

120. (c) $\cot\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 60°$

$\therefore \frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\operatorname{cosec}^2\theta - \sec\theta)$

Put $\theta = 60°$

$= \frac{2 - \frac{3}{4}}{\frac{3}{4}} + \left(\frac{4}{3} - 2\right)$

$= \frac{\frac{8-3}{4}}{\frac{3}{4}} + \frac{(4-6)}{3} = \frac{5}{3} - \frac{2}{3} = 1$

121. (b) $3\tan\theta = 2\sqrt{3}\sin\theta$

$\Rightarrow \frac{3\sin\theta}{\cos\theta} = 2\sqrt{3}\sin\theta \Rightarrow \cos\theta = \frac{\sqrt{3}}{2}$

$\Rightarrow \theta = 30°$

$\therefore \frac{\operatorname{cosec}^2 2\theta + \cot^2 2\theta}{\sin^2\theta + \tan^2 2\theta}$

$= \frac{\left(\frac{2}{\sqrt{3}}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2}{\left(\frac{1}{2}\right)^2 + \left(\sqrt{3}\right)^2} = \frac{\frac{5}{3}}{\frac{13}{4}} = \frac{20}{39}$

122. (b) $4\sin^2(2x - 10)° = 3$

$\Rightarrow \sin(2x - 10)° = \frac{\sqrt{3}}{2}$

$\Rightarrow \sin(2x - 10)° = \sin 60°$

$\Rightarrow 2x - 10° = 60°$

$\Rightarrow x = 35°$

$\therefore \frac{\sin^4 30° + \cos^4 30°}{1 - 2\sin^2 90°\cos^2 90°}$

$= \frac{1}{16} + \frac{9}{16} = \frac{5}{8}$

123. (b) $3(\cot^2\phi - \cos^2\phi) = \cos^2\phi$

$\Rightarrow 3\cot^2\phi - 3\cos^2\phi = \cos^2\phi$

$\Rightarrow 3\cot^2\phi = 4\cos^2\phi$

$\Rightarrow \frac{3\cos^2\phi}{\sin^2\phi} = 4\cos^2\phi$

$\Rightarrow \frac{3}{4} = \sin^2\phi$

$\Rightarrow \sin\phi = \frac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow \phi = 60°$

Now, $(\tan^2\phi + \operatorname{cosec}^2\phi + \sin^2\phi)$

$= \tan^2 60° + \operatorname{cosec}^2 60° + \sin^2 60°$

$= \left(\sqrt{3}\right)^2 + \left(\frac{2}{\sqrt{3}}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$= 3 + \frac{4}{3} + \frac{3}{4} = \frac{61}{12}$

124. (a) $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$

$\Rightarrow \cos^2\theta = 3\cot^2\theta - 3\cos^2\theta$

$\Rightarrow 4\cos^2\theta = \frac{3\cos^2\theta}{\sin^2\theta}$

$\Rightarrow \sin^2\theta = \frac{3}{4} \Rightarrow \sin\theta$

$= \frac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow \theta = 60°$

Now, $\cot\theta + \operatorname{cosec}\theta = \cot 60° + \operatorname{cosec} 60°$

$= \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

125. (b) $\frac{\tan x}{\sec x} = \frac{1}{2} \Rightarrow \frac{\sin x}{\cos x \times \sec x} = \frac{1}{2}$

$\Rightarrow \sin x = \frac{1}{2} = \sin 30° \Rightarrow x = 30°$

$\therefore (\sin x + \cos x)^2 = \left(\frac{1}{2} + \frac{\sqrt{3}}{2}\right)^2$

$= \left(\frac{\sqrt{3}+1}{2}\right)^2 = \frac{4 + 2\sqrt{3}}{4} = \frac{2 + \sqrt{3}}{2}$

126. (b) $\sin\theta + \cos\theta = \sqrt{3}\cos\theta$

divided by $\cos\theta$

$\Rightarrow \frac{\sin\theta}{\cos\theta} + 1 = \sqrt{3}$

$\Rightarrow \tan\theta = \sqrt{3} - 1$

$\therefore \cot\theta = \frac{1}{\sqrt{3} - 1}$

$= \frac{1}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1} = \frac{\sqrt{3} + 1}{2}$

127. (a) $\cot^2\theta - 2\cos^2\theta = 0$

$\Rightarrow \cot^2\theta = 2\cos^2\theta$

$\Rightarrow \frac{\cos^2\theta}{\sin^2\theta} = 2\cos^2\theta$

$\Rightarrow \frac{1}{\sin^2\theta} = 2 \Rightarrow \sin^2\theta = \frac{1}{2}$

$\Rightarrow \sin\theta = \frac{1}{\sqrt{2}} \Rightarrow \theta = 45°$

Alternate Method:-

$\cot^2\theta - 2\cos^2\theta = 0$

Put $\theta = 45°$

$\Rightarrow \cot^2 45 - 2\cos^2 45° = 0$

$\Rightarrow 1 - 2 \times \left(\frac{1}{\sqrt{2}}\right)^2 = 0$

$\Rightarrow 1 - 2 \times \frac{1}{2} = 0 \Rightarrow 1 - 1 = 0$

$\therefore \theta = 45°$

128. (d) $\sin^4\theta + \cos^4\theta = 2\sin^2\theta\cos^2\theta$

$\Rightarrow \sin^4\theta + \cos^4\theta - 2\sin^2\theta\cos^2\theta = 0$

$\Rightarrow \left(\sin^2\theta - \cos^2\theta\right)^2 = 0$

$\Rightarrow \sin^2\theta - \cos^2\theta = 0$

$\Rightarrow \sin^2\theta = \cos^2\theta$

$\therefore [\sin\alpha = \cos\beta \text{ when } \alpha + \beta = 90°]$

$\Rightarrow \theta = 45°$

$\therefore \cot 45° = 1$

Alternate Method:

Put $\theta = 45°$

$\therefore \sin^4 45° + \cos^4 45° = 2\sin^2 45°.\cos^2 45°$

$\Rightarrow \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^4 = 2\times\left(\frac{1}{\sqrt{2}}\right)^2 \cdot \left(\frac{1}{\sqrt{2}}\right)^2$

$\Rightarrow \frac{1}{4} + \frac{1}{4} = 2\times\frac{1}{2}\times\frac{1}{2} \Rightarrow \frac{2}{4} = \frac{2}{4}$

LHS = RHS

So, $\cot 45° = 1$

SMART APPROACH:-

We know, $\cot\theta$ possible value only and only could be $\infty, \sqrt{3}, 1, \frac{1}{\sqrt{3}}$ and 0

In given option, only option 'd' has 1 value which shows $\cot 45° = 1$

129. (d) Given, $\sin\theta - \cos\theta = 0$

$\Rightarrow \sin\theta = \cos\theta$

$\Rightarrow \theta = 45°$

$\therefore \sin(\pi - \theta) + \sin\left(\frac{\pi}{2} - \theta\right)$

$= \sin(\pi - 45) + \sin\left(\frac{\pi}{2} - 45\right)$

$= \sin 45° + \cos 45° = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \sqrt{2}$

130. (c) $4\sin^2 A - 3 = 0$

$\Rightarrow 4\sin^2 A = 3 \Rightarrow \sin^2 A = \frac{3}{4}$

$\Rightarrow \sin A = \frac{\sqrt{3}}{2} \Rightarrow A = 60°$

$\because 3\sin A - 4\sin^3 A$

$= \sin 3A = \sin 3 \times 60° = \sin 180° = 0$

131. (a) $4\sin^2\theta = 3(1 + \cos\theta)$

$\Rightarrow 4(1 - \cos^2\theta) = 3(1 + \cos\theta)$

$\Rightarrow 4\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1 \rightarrow B}{4 \rightarrow H}$

$P = \sqrt{4^2 - 1^2} = \sqrt{15}$

$\therefore 2\tan\theta + 4\sin\theta - \sec\theta$

$= \frac{2\sqrt{15}}{1} + 4\frac{\sqrt{15}}{4} - 4 = 3\sqrt{15} - 4$

132. (b) $3\tan\theta = 2\sqrt{3}\sin\theta$

$\Rightarrow \frac{3\sin\theta}{\cos\theta} = 2\sqrt{3}\sin\theta$

$\Rightarrow \cos\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 30°$

$\therefore 2\sin^2 2\theta - 3\cos^2 3\theta$

$= 2\sin^2 60° - 3\cos^2 90°$

$= 2 \times \left(\frac{3}{4}\right) - 3 \times 0 = \frac{3}{2}$

133. (b) $\sin\frac{(2A+B)}{2} = \frac{\sqrt{3}}{2}$

$\Rightarrow \sin\frac{(2A+B)}{2} = \sin 60°$

$\Rightarrow 2A + B = 120°$ ______(i)

Now,

$\cos\frac{(2A-B)}{2} = \frac{\sqrt{3}}{2}$

$\Rightarrow \cos\frac{(2A-B)}{2} = \cos 30°$

$\Rightarrow 2A - B = 60°$ ______(ii)

On solving eq. (i) and (ii)

$A = 45°, B = 30°$

$\therefore \sin[3(A - B)] = \sin[3(45° - 30°)]$

$= \sin 45° = \frac{1}{\sqrt{2}}$

134. (c) $\sin(x + y) = 1 \Rightarrow x + y = 90°$

$\cos(x - y) = \frac{\sqrt{3}}{2} \Rightarrow x - y = 30°$

$\therefore y = \frac{90° - 30°}{2} = 30°$

135. (c) Given, $\sin(p + q) = 1$

$\Rightarrow \sin(p + q) = \sin 90°$

$\Rightarrow p + q = 90°$ ....(i)

$\cos(p - q) = \frac{\sqrt{3}}{2} = 30°$

$\Rightarrow p - q = 30°$ ....(ii)

Solve Eq^n (i) and (ii)

$p = \frac{90° + 30°}{2} = 60°$

136. (b) Given, $\sin(A - B) = \frac{1}{2} = \sin 30°$

$\Rightarrow A - B = 30°$ ......(i)

$\sin(A + B) = 1 = 90°$

$\Rightarrow A + B = 90°$ ....(ii)

From Eq^n (i) and (ii)

$A = \frac{90 + 30}{2} = 60°,$

$B = \frac{90 - 30}{2} = 30°$

137. (d) $\tan(A + B - C) = \frac{1}{\sqrt{3}} = \tan 30°$

$\cos(B + C - A) = \frac{1}{2} = \cos 60°$

$\sin(C + A - B) = \frac{1}{\sqrt{2}} = \sin 45°$

Now,

$\Rightarrow A + B - C = 30°$ ....(i)

$\Rightarrow B + C - A = 60°$ ....(ii)

$\Rightarrow C + A - B = 45°$

.....(iii)

Add Eq^n (i) + (ii) + (iii)

$\Rightarrow A + B - C + B + C - A + C + A - B$

$= 30° + 60° + 45°$

$\Rightarrow A + B + C = 135°$

138. (a) $\sin(x - y) = \frac{1}{2}$ and $\cos(x + y) = \frac{1}{2}$

$x - y = 30°$

$\underline{x + y = 60}$

$2x = 90°$

$x = 45°$

$\sin x \cos x + 2\sin^2 x + \cos^3 x \sec x$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + 2 \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{\sqrt{2}} \times \sqrt{2}$

$= \frac{1}{2} + \frac{1}{1} + \frac{1}{2} = \frac{4}{2} = 2$

139. (b) $\tan(x + y) = 1$ and

$\cos(x - y) = \frac{\sqrt{3}}{2}$ (given)

$x + y = 45°$

$\underline{x - y = 30°}$

$2x = 75° \Rightarrow x = 37.5 \Rightarrow y = 7.5$

140. (a) $\tan(A + B) = \sqrt{3}$

$\Rightarrow \tan(A + B) = \tan 60°$

$\Rightarrow A + B = 60°$ .....(i)

$\tan(A - B) = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan(A - B) = \tan 30°$

$\Rightarrow A - B = 30°$ .....(ii)

Adding (i) and (ii) we get

$A = 45°, B = 15°$

141. (a) $\because \cos 2\theta = 0$

$\Rightarrow 2\theta = 90° \Rightarrow \theta = 45°$

$\therefore \sin(75° - 45°) = \sin 30° = \frac{1}{2}$

142. (b) $P\sin 60° = Q\,\mathrm{cosec}\,45°$

$\Rightarrow \frac{P}{Q} = \frac{\mathrm{cosec}\,45°}{\sin 60°} = \frac{\sqrt{2}}{\frac{\sqrt{3}}{2}}$

$\Rightarrow \frac{P}{Q} = \frac{2\sqrt{2}}{\sqrt{3}} \Rightarrow \frac{P^2}{Q^2} = \frac{8}{3}$

Use C and D rule

$\therefore \frac{P^2 + Q^2}{P^2 - Q^2} = \frac{8 + 3}{8 - 3} = \frac{11}{5}$

143. (d) Given,

$\alpha \sin 45° = \beta.\,\mathrm{cosec}\,30°$

$\Rightarrow \frac{\alpha}{\beta} = 2\sqrt{2} \Rightarrow \left(\frac{\alpha}{\beta}\right)^4 = (2\sqrt{2})^4$

$\therefore \frac{\alpha^4}{\beta^4} = 4^3$

144. (a) $\sin x = \frac{1}{2} \Rightarrow x = 30°$

$\therefore \sec^4 x + \mathrm{cosec}^4 x - \tan^4 x - \cot^4 x$

$= \left(\frac{2}{\sqrt{3}}\right)^4 + (2)^4 - \left(\frac{1}{\sqrt{3}}\right)^4 - (\sqrt{3})^4$

$= \frac{16}{9} + 16 - \frac{1}{9} - 9 = \frac{15}{9} + 7$

$= \frac{15 + 63}{9} = \frac{78}{9} = \frac{26}{3}$

145. (b) $\cos\theta - \sin\theta = \sqrt{3}\cos(90° - \theta)$

$\Rightarrow \cos\theta - \sin\theta = \sqrt{3}\sin\theta$

$\Rightarrow \cot\theta - 1 = \sqrt{3}$

$\Rightarrow \cot\theta = \sqrt{3} + 1$

$\therefore \tan\theta - \cot\theta = \frac{1 - \mathrm{Cot}^2\theta}{\mathrm{Cot}\,\theta}$

$= \frac{1 - (\sqrt{3} + 1)^2}{\sqrt{3} + 1}$

$= \frac{1 - 3 - 1 - 2\sqrt{3}}{\sqrt{3} + 1} = -\frac{(3 + 2\sqrt{3})}{\sqrt{3} + 1}$

146. (a) $\mu = 60°$

$\therefore \sin\mu + \cos(90° - \mu)$

$= \sin 60° + \cos(90° - 60°)$

$= \sin 60° + \sin 60° = \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} = \sqrt{3}$

147. (a) $\tan(90 - \theta) = \frac{2}{\sqrt{3}}$

$\Rightarrow \cot\theta = \frac{2}{\sqrt{3}} \Rightarrow \tan\theta = \frac{\sqrt{3}}{2}$

$\therefore 2\sqrt{3}\tan\theta + 1 = 2\sqrt{3} \times \frac{\sqrt{3}}{2} + 1 = 4$

148. (a) $\sin^2\frac{2\pi}{3} + \cos^2\frac{5\pi}{6} - \tan^2\frac{3\pi}{4}$

$= \sin^2 120° + \cos^2 150° - \tan^2 135°$

$= \cos^2 30° + \sin^2 60° - \cot^2 45°$

$= \frac{3}{4} + \frac{3}{4} - 1 = \frac{1}{2}$

149. (c) $\cos^2(90° - \theta) - \left[\frac{\cos(90°-\theta)\cos\theta}{\cot\theta}\right]$

$= \sin^2\theta - \frac{\sin\theta\cos\theta}{\cot\theta}$

$= \sin^2\theta - \sin^2\theta = 0$

150. (b) $\sin 74° + \tan 74°$

$= \sin(90° - 16°) + \tan(90° - 16°)$

$= \cos 16° + \cot 16°$

151. (a) $\frac{4\cos(90-\theta)\sin^3(90+\theta) - 4\sin(90+\theta)\cos^3(90-\theta)}{\cos\left(\frac{180+8\theta}{2}\right)}$

$= \frac{4\sin\theta\cos^3\theta - 4\cos\theta\sin^3\theta}{-\sin 4\theta}$

$= \frac{4\sin\theta\cos\theta[\cos^2\theta - \sin^2\theta]}{-\sin 4\theta}$

$= \frac{2\sin 2\theta\cos 2\theta}{-\sin 4\theta} = \frac{\sin 4\theta}{-\sin 4\theta} = -1$

152. (a) $\frac{5\cos^2 120° + 4\sec^2 30° - \tan^2 135°}{\sin^2 30° + \cos^2 30°}$

$= \frac{5\cos^2(90°+30°) + 4\sec^2 30° - \tan^2(90°+45°)}{\sin^2 30° + \cos^2 30°}$

$= \frac{5\sin^2 30° + 4\sec^2 30° - \cot^2 45°}{\sin^2 30° + \cos^2 30°}$

[$\therefore \sin^2\theta + \cos^2\theta = 1$]

$= \frac{5 \times \frac{1}{4} + 4 \times \frac{4}{3} - (+1)}{1} \Rightarrow \frac{5}{4} + \frac{16}{3} - \frac{1}{1}$

$= \frac{15 + 64 - 12}{12} = \frac{67}{12}$

$\cos(90 + \theta) = \sin\theta$ and in 2nd Quadrant cos(–ve), $\tan(90 + \theta) = \cot\theta$ in 2nd quadrant tan (–ve) and $\sin^2\theta + \cos^2\theta = 1$

153. (b) $\sin 150° = \sin(90° + 60°)$

$= \cos 60° = \frac{1}{2} = 0.5$

154. (c) $\tan 570° = \tan(360° + 210°)$

$= \tan 210° = \tan(180° + 30°)$

$= \tan 30° = \frac{1}{\sqrt{3}}$

155. (a) $\cos x = \frac{-1}{2}$

$\Rightarrow \cos x = -(\cos 60°)$

$\Rightarrow \cos x = \cos 60°$

x lies in IIIrd quad, $x = 60°$

in third quadrant, $\tan\theta$ is positive

So, $\tan x = \tan 60°$

$\Rightarrow x = \sqrt{3}$

156. (d) $\cos\left(\frac{-7\pi}{2}\right) = \cos\left(4\pi - \frac{\pi}{2}\right)$

$= \cos\frac{\pi}{2} = 0$

157. (c) cosec 2910° + sec 4260° + tan 2565° + cot 1755°

= cosec(360°× 8 + 30°) + sec (360° × 12 – 60°] + tan (360° × 7 + 45°) + cot(360° × 5 – 45°)

= cosec30° + sec60° + tan45° – cot45°

= 2 + 2 + 1 – 1 = 4

158. (d) $\frac{1}{\cos x}\sqrt{\frac{\cos(\pi+x)\cos(-x)}{\sin(\pi-x)\cos\left(\frac{\pi}{2}+x\right)}}$

$= \frac{1}{\cos x}\sqrt{\frac{(-\cos x)\cos x}{\sin x(-\sin x)}}$

$= \frac{1}{\cos x}\sqrt{\frac{\cos^2 x}{\sin^2 x}} = \text{cosec}\, x$

159. (d) $\frac{\cos(\pi - A)\cot\left(\frac{\pi}{2} + A\right)\cos(-A)}{\tan(\pi + A)\tan\left(\frac{3\pi}{2} + A\right)\sin(2\pi - A)}$

$= \frac{(-\cos A)(-\tan A)\cos A}{\tan A(-\cot A)(-\sin A)}$

$= \frac{\sin A\cos A}{\sin A} = \cos A$

160. (d) cosec56°.cos34° – cos59°. cosec31°

= 1 – 1 = 0

Note: cosecα × cosβ = 1

When, α + β = 90°

161. (c) cos47°.sec133° + sin44°. cosec136°

[We know, sec(180° – θ) = – secθ

∴ sec133°= sec(180° – 74) = – sec47]

cos47°(– sec47°) + sin44°. (cosec44°) = –1 + 1 = 0

162. (d) 2(sin1° × sec 89°) + 3 (cos 11° × cosec 79°) + 5 (tan 21° × tan 69°)

= 2 + 3 + 5 = 10

[If A + B = 90° Then,

sinA secB = 1, cosA cosecB = 1,

tanA cotB = 1]

163. (a) cot13°cot27°cot60°cot63° cot77°

[If A + B = 90° Then, cotA cotB = 1]

= cot13.cot77.cot27.cot63.cot60

$= \cot 60° = \frac{1}{\sqrt{3}}$

164. (a) 7(cot11° cot13°cot19° cot29° cot61° cot71° cot77° cot79°)

[If (A + B) = 90° Then, cotA.cotB = 1]

⇒ 7(cot11. cot79. cot13. cot77. cot19. cos71. cot29. cot61°)

= 7 × 1 = 7

165. (b) $\frac{\tan 55°}{\cot 35°} = 1$

Note: tanα = cotβ When, α + β = 90°

166. (d) $\frac{3\sin 58°}{5\cos 32°} + \frac{2\cos 62°}{5\sin 28°} = \frac{3}{5} + \frac{2}{5} = 1$

Note: sinα = cosβ

When, α + β = 90°

167. (a) $\frac{\sec 35°}{\text{cosec}\, 55°} - \frac{\cos 25°}{\sin 65°}$

= 1 – 1 = 0

Note: secα = cosecβ

When, α + β = 90°

168. (b) $2\frac{\tan 54°}{\cot 36°} - \frac{\cot 41°}{\tan 49°}$

= 2 × 1 – 1 = 1

Note: tanα = cotβ

When, α + β = 90°

169. (d) $\frac{\cos 25° - \sin 65°}{\cos 25° + \sin 65°}$

{∵ cos(90° – 65°) = sin65°}

$= \frac{\sin 65° - \sin 65°}{\cos 25° + \sin 65°} = 0$

170. (c)

$7\left(\frac{\text{cosec}\, 24°}{\sec 66°}\right)^3 + 8\left(\frac{\cot 37°}{\tan 53°}\right)^4 - \left(\frac{2\sec 14°}{\text{cosec}\, 76°}\right)^2 + \left(\frac{-3\tan 82°}{\cot 8°}\right)^3$

[cosecα = secβ, tanα = cotβ,

If α + β = 90°]

$= 7(1)^3 + 8(1)^4 - (2)^2 + (-3)^3$

= 7 + 8 – 4 – 27

= –16

171. (a) If (A + B) = 90°

Then,

$\frac{\sin A}{\cos B} = 1$ and $\frac{\cos A}{\sin B} = 1$

$\frac{\cos 65°}{\sin 25°} + \frac{5\sin 19°}{\cos 71°} - \frac{3\cos 28°}{\sin 62°}$

= 1 + 5 – 3 = 3

172. (d) $\frac{\cos 37°}{\sin 53°}$ – cos47° cosec43°

= 1 – 1 = 0

[If A + B = 90° Then,

$\frac{\sin A}{\cos B} = 1$ and cosA cosecB = 1]

173. (d) $\frac{\cos 65°}{\sin 25°} + \frac{\cos 55°}{\sin 35°}$ – tan 50° cot50°

= 1 + 1 – 1 = 1

[If A + B = 90° Then, $\frac{\sin A}{\cos B} = 1$]

174. (c) $\frac{\cos 50°}{\sin 40°} + \frac{3\,\text{cosec}\, 80°}{\sec 10°}$

– 2cos50°cosec40°

$= \frac{\cos(90° - 40°)}{\sin 40°} + \frac{3\,\text{cosec}(90° - 10°)}{\sec 10°}$

–2cos50°cosec(90°–50°)

$= \frac{\sin 40°}{\sin 40°} + \frac{3\sec 10°}{\sec 10°}$ – 2cos 50°sec50°

= 1 + 3 – 2 = 4 – 2 = 2

Alternate Method:

If A + B = 90°

Then, $\frac{\cos A}{\sin B} = 1$

$\frac{\cos 50°}{\sin 40°} + \frac{3\,\text{cosec}\, 80°}{\sec 10°}$

– 2cos50°cosec40°

= 1 + 3 – 2 = 2

175. (a) $\frac{2\cos 15°\sin 15°}{\cos^2 15° - \sin^2 15°}$

$= \frac{\sin 30°}{\cos 30°} = \tan 30° = \frac{1}{\sqrt{3}}$

$\begin{bmatrix} 2\sin\theta\cos\theta = \sin 2\theta \\ \cos^2\theta - \sin^2\theta = \cos 2\theta \end{bmatrix}$

176. (c) Given,

tan(x + y) tan(x – y) = 1

If tanA × tanB = 1

then, A + B = 90°

Now,

x + y + x – y = 90°

then, 2x = 90°, x = 45°

Hence, tan45° = 1

Alternate Method:

tan(x + y) tan(x – y) = 1

Put y = 0

$\tan^2 x = 1 \Rightarrow \tan x = 1$

$x = 45° \Rightarrow \tan 45° = 1$

177. (c) $\cos(2\theta + 54°) = \sin\theta$

$\Rightarrow 2\theta + 54° + \theta = 90°$

$\Rightarrow 3\theta = 36° \Rightarrow \theta = 12°$

$\therefore \dfrac{1}{\cot 5\theta + \sec\dfrac{5\theta}{2}} = \dfrac{1}{\cot 60° + \sec 30°}$

$= \dfrac{1}{\dfrac{1}{\sqrt{3}} + \dfrac{2}{\sqrt{3}}} = \dfrac{1}{\sqrt{3}} = \dfrac{\sqrt{3}}{3}$

178. (b) $\sin 3A = \cos(A + 10°)$

$\Rightarrow 3A + A + 10 = 90° \Rightarrow 4A = 80°$

$\Rightarrow A = 20°$

$\therefore 2\operatorname{cosec}\dfrac{3A}{2} + 6\tan^2 3A - \dfrac{3}{2}\tan^2 3A$

$= 2\operatorname{cosec} 30° + 6\tan^2 60° - \dfrac{3}{2}\tan^2 60°$

$= 2 \times 2 + 6 \times 3 - \dfrac{3}{2} \times 3$

$= 22 - \dfrac{9}{2} = \dfrac{44 - 9}{2} = \dfrac{35}{2}$

179. (a) $\sin 3A = \cos(A - 26°)$

If $A + B = 90°$, then, $\sin A = \cos B$

So, $3A + A - 26° = 90°$

$\Rightarrow 4A = 116° \quad \therefore A = 29°$

180. (d) $\sec 6A = \operatorname{cosec}(A - 29°)$

If $\sec A = \operatorname{cosec} B$

Then, $A + B = 90°$

$\Rightarrow 6A + A - 29° = 90°$

$\Rightarrow 7A = 90° + 29° = 119°$

$\Rightarrow A = \dfrac{119°}{7} = 17°$

181. (b) If $\sin\alpha = \cos\beta$ then $\alpha + \beta = 90°$

$\sin(x + y) = \cos\{3(x + y)\}$

$\Rightarrow x + y + 3x + 3y = 90°$

$\Rightarrow 4x + 4y = 90°$

$\Rightarrow 2(x + y) = 45°$

$\therefore \cot\{2(x + y)\} = \cot 45° = 1$

182. (a) $\sin(5x - 40°) = \cos(5y + 40°)$

$\Rightarrow \sin(5x - 40°) = \sin(90° - 5y - 40°)$

$\Rightarrow 5x - 40° = 50° - 5y$

$\Rightarrow x + y = \dfrac{90°}{5} = 18°$

183. (d) Given, $\cos(3\alpha) = \sin(\alpha - 22°)$

(If $\sin\theta = \cos\phi$, then $\theta + \phi = 90°$)

$\Rightarrow 3\alpha + \alpha - 22° = 90°$

$\Rightarrow 4\alpha = 112° \Rightarrow \alpha = 28°$

184. (a) $\tan(5\theta - 10°) = \cot(5\phi + 20°)$

$\Rightarrow \tan(5\theta - 10°) = \tan(90° - 5\phi - 20°)$

$\Rightarrow 5\theta - 10° = 70° - 5\phi$

$\Rightarrow 5\theta + 5\phi = 80 \Rightarrow \theta + \phi = 16°$

185. (c) If $A + B = 90°$, then $\sin\theta = \cos\theta$

$\Rightarrow \sin(5x - 25°) = \cos(5y + 25°)$

$\Rightarrow 5x - 25° + 5y + 25° = 90°$

$\Rightarrow 5x + 5y = 90°$

$\Rightarrow x + y = 18°$

186. (d) $\cos\theta = \sin 2\theta$

$[\because \sin 2\theta = 2\sin\theta \times \cos\theta]$

$\Rightarrow \cos\theta = 2\sin\theta\cos\theta \Rightarrow \dfrac{1}{2} = \sin\theta$

$\Rightarrow \sin 30° = \sin\theta \Rightarrow \theta = 30°$

$\therefore \cos^4 30° + \sin^4 30° + \cos^3 30° + \sin^3 30° + \sin^2 30° + \cos^2 30° + \sin 30° + \cos 30°$

$= \dfrac{9}{16} + \dfrac{1}{16} + \dfrac{3\sqrt{3}}{8} + \dfrac{1}{8} + \dfrac{1}{4} + \dfrac{3}{4} + \dfrac{1}{2} + \dfrac{\sqrt{3}}{2}$

$= \dfrac{36 + 14\sqrt{3}}{16} = \dfrac{18 + 7\sqrt{3}}{8}$

187. (b) $\sec(5\alpha - 15°) = \operatorname{cosec}(15° - 2\alpha)$

$\Rightarrow (5\alpha - 15°) + (15° - 2\alpha) = 90°$

$\Rightarrow 3\alpha = 90°$

$\Rightarrow \alpha = 30°$

$\therefore \cos 3\alpha + \sin 2\alpha + \cot\alpha$

$= 0 + \dfrac{\sqrt{3}}{2} + \sqrt{3} = \dfrac{3\sqrt{3}}{2}$

188. (b) $\sin^2 35° + \sin^2 55°$

$= \sin^2 35° + \sin^2(90° - 35°)$

$= \sin^2 35 + \cos^2 35° = 1$

189. (c) $\cos^2 29° + \cos^2 61° = 1$

Note: $\cos^2\alpha + \cos^2\beta = 1$

When, $\alpha + \beta = 90°$

190. (d) $\sin^2 30° - \sin^2 40° + \sin^2 45° - \sin^2 55° - \sin^2 35° + \sin^2 45° - \sin^2 50° + \sin^2 60°$

$= \sin^2 30° + 2\sin^2 45° + \sin^2 60° - (\sin^2 40° + \sin^2 50° + \sin^2 55° + \sin^2 35°)$

$= \dfrac{1}{4} + 2 \times \dfrac{1}{2} + \dfrac{3}{4} - (1 + 1)$

$= \dfrac{1}{4} + 1 + \dfrac{3}{4} - 2$

$= 2 - 2 = 0$

Note: $\sin^2\alpha + \sin^2\beta = 1$

When, $\alpha + \beta = 90°$

191. (c)

$\sin^2 15° + \sin^2 25° + \sin^2 35° + \sin^2 45° + \sin^2 55° + \sin^2 65° + \sin^2 75°$

$\therefore \left[\begin{array}{l} \sin^2 A + \sin^2 B = 1 \\ \text{When } A + B = 90° \end{array}\right]$

$= 1 + 1 + 1 + \dfrac{1}{2}$

$= 3 + \dfrac{1}{2} = \dfrac{7}{2}$

192. (b) $\sec^2 54° - \cot^2 36° + \dfrac{3}{2}\sin^2 37° \times \sec^2 53° + \dfrac{2}{\sqrt{3}}\tan 60°$

We know, $\boxed{\begin{array}{l} \sec(90° - x) = \operatorname{cosec} x \\ \operatorname{cosec}(90° - x) = \sec x \end{array}}$

$= \operatorname{cosec}^2 36° - \cot^2 36° + \dfrac{3}{2}\sin^2 37° \times \operatorname{cosec}^2 37° + \dfrac{2}{\sqrt{3}}\tan 60°$

$= 1 + \dfrac{3}{2} \times 1 + \dfrac{2}{\sqrt{3}} \times \sqrt{3}$

$= 1 + \dfrac{3}{2} + 2 = \dfrac{9}{2}$

193. (c)

$\dfrac{\sin^2 30° + \cos^2 60° - \sec 35°.\sin 55°}{\sec 60° + \operatorname{cosec} 30°}$

$= \dfrac{\dfrac{1}{4} + \dfrac{1}{4} - \operatorname{cosec} 55° \sin 55°}{2 + 2}$

$= \dfrac{\dfrac{1}{2} - 1}{4} = \dfrac{-1}{8}$

194. (a) $\dfrac{\sin 23° \cos 67° + \sec 52° \sin 38° + \cos 23° \sin 67° + \operatorname{cosec} 52° \cos 38°}{\operatorname{cosec}^2 20° - \tan^2 70°}$

$= \dfrac{\sin 23° \cos(90° - 23°) + \sec(90 - 38°)\sin 38° + \cos 23° \sin(90 - 23°) + \operatorname{cosec}(90 - 38°)\cos 38°}{\operatorname{cosec}^2(90 - 70°) - \tan^2 70°}$

$= \dfrac{\sin^2 23° + \operatorname{cosec} 38° \sin 38° + \cos^2 23° + \sec 38° \cos 38°}{\sec^2 70° - \tan^2 70°}$

$[\because \sin^2\theta + \cos^2\theta = 1, \sec^2\theta - \tan^2\theta = 1]$

$= \dfrac{1 + 1 + 1}{1} = 3$

195. (d) $\dfrac{3(\cot^2 47° - \sec^2 43°) - 2(\tan^2 23° - \operatorname{cosec}^2 67°)}{\operatorname{cosec}^2(68° + \theta) - \tan(\theta + 61°) - \tan^2(22° - \theta) + \cot(29° - \theta)}$

$= \dfrac{3[\cot^2(90° - 43°) - \sec^2 43°] - 2[\tan^2(90° - 67°) - \operatorname{cosec}^2 67°]}{\operatorname{cosec}^2(68° + \theta) - \tan^2[90° - (68° + \theta)] - \tan(\theta + 61°) + \cot[90° - (61° + \theta)]}$

$= \dfrac{3(\tan^2 43° - \sec^2 43°) - 2(\cot^2 67° - \operatorname{cosec}^2 67°)}{\operatorname{cosec}^2(68° + \theta) - \cot^2(68° + \theta) - \tan(\theta + 61°) + \tan(\theta + 61°)}$

$= \dfrac{3(-1) - 2(-1)}{1} = -1$

196. (d)

$\dfrac{2\sin^2 38° \sec^2 52° + \cos 64° \sin 26° + \sin^2 64°}{\tan^2 23° + \cot^2 23° - \sec^2 67° - \operatorname{cosec}^2 67°}$

$= \dfrac{2\sin^2 38° \sec^2(90 - 38°) + \cos 64° \sin(90 - 26°) + \sin^2 64°}{\tan^2(90 - 67°) + \cot^2(90 - 67°) - \sec^2 67° - \operatorname{cosec}^2 67°}$

$= \dfrac{2\sin^2 38° \operatorname{cosec}^2 38° + \cos^2 64° + \sin^2 64°}{\tan^2 67° + \cot^2 67° - \sec^2 67° - \operatorname{cosec}^2 67°}$

$= \dfrac{2\sin^2 38° \times \dfrac{1}{\sin^2 38°} + \sin^2 64° + \cos^2 64°}{\tan^2 67° - \sec^2 67° + \cot^2 67° - \operatorname{cosec}^2 67°}$

$[\because \sin^2\theta + \cos^2\theta = 1, \sec^2\theta - \tan^2\theta = 1$
$\operatorname{cosec}^2\theta - \cot^2\theta = 1]$

$= \dfrac{2 + 1}{-1 - 1} = \dfrac{-3}{2}$

197. (a) $\sqrt{\dfrac{9\sin^2 26° + 9\sin^2 64° + 36}{32 - 7\cos^2 32° - 7\cos^2 58°}}$

$= \sqrt{\dfrac{9\sin^2 26° + 9\cos^2 26° + 36}{32 - 7\sin^2 58° - 7\cos^2 58°}}$

$= \sqrt{\dfrac{9 + 36}{32 - 7}} = \sqrt{\dfrac{45}{25}} = \sqrt{\dfrac{9}{5}}$

$= \dfrac{3}{\sqrt{5}} = \dfrac{3\sqrt{5}}{5}$

198. (a) $\left(\dfrac{\sin 23° \cos 67° + \cos 23° \sin 67°}{\operatorname{cosec}^2 15° - \tan^2 75°}\right)^3$

$= \left(\dfrac{\sin 23° \cos(90 - 23°) + \cos 23° \sin(90 - 23°)}{\operatorname{cosec}^2 15° - \tan^2(90° - 15°)}\right)^3$

$= \left(\dfrac{\sin^2 23° + \cos^2 23°}{\operatorname{cosec}^2 15° - \cot^2 15°}\right)^3$

$\therefore [\sin^2\theta + \cos^2\theta = 1, \operatorname{cosec}^2\theta - \cot^2\theta = 1]$

$= (1)^3 = 1$

199. (b) If A + B = 90° then

$$\frac{\cot A}{\cot B} + \cos^2 A + \cos^2 B$$

$$= \frac{\cot(90° - B)}{\cot B} + \cos^2(90° - B) + \cos^2 B$$

$$= \frac{\tan B}{\cot B} + \sin^2 B + \cos^2 B$$

$$= \tan^2 B + 1 = \sec^2 B = \sec^2(90° - A)$$

$$= \text{cosec}^2 A$$

Alternate Method:

Let A = 60°, B = 30°

$$\frac{\cot 60°}{\cot 30°} + \cos^2 60° + \cos^2 30°$$

$$= \frac{1}{\sqrt{3} \times \sqrt{3}} + \frac{1}{4} + \frac{3}{4} = \frac{1}{3} + 1 = \frac{4}{3}$$

Go through options,

$$\text{cosec}^2 A = \text{cosec}^2 60° = \left(\frac{2}{\sqrt{3}}\right)^2 = \frac{4}{3}$$

200. (c)

$$\frac{[\tan^2(22° - \theta) - \tan^2(\theta + 68°) - \text{cosec}^2(68° + \theta) + \cot^2(22° - \theta)]}{[3(\cot^2 52° - \sec^2 38°) + 2(\text{cosec}^2 28° - \tan^2 62°)]}$$

Put θ = 0°

$$= \tan^2 22° - \tan^2 68° - \text{cosec}^2 68° + \cot^2 22°$$

$$= \tan^2(90° - 68°) - \tan^2 68° - \text{cosec}^2 68° + \cot^2(90° - 68°)$$

$$= \cot^2 68° - \text{cosec}^2 68° = -1$$

$$\Rightarrow \frac{-1}{-3+2} = 1$$

Using
$\tan(90° - \theta) = \cot\theta$
$\text{cosec}(90° - \theta) = \sec\theta$
$\sec^2\theta - \tan^2\theta = 1$
$\text{cosec}^2\theta - \cot^2\theta = 1$

201. (b)

$$\frac{4\tan^2 30° + \sin^2 30° \cos^2 45° + \sec^2 48° - \cot^2 42°}{\cos 37° \sin 53° + \sin 37° \cos 53° + \tan 18° \tan 72°}$$

$$= \frac{4 \times \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2 + \sec^2 48° - \cot^2(90° - 48°)}{\cos 37° \sin 53° + \sin 37° \cos 53° + \tan 18° \tan(90° - 18°)}$$

$$= \frac{\frac{4}{3} + \frac{1}{8} + \sec^2 48° - \tan^2 48°}{\sin 90° + 1}$$

$$= \frac{\frac{4}{3} + \frac{1}{8} + 1}{1+1} = \frac{32+3+24}{24_2}$$

$$= \frac{59}{24 \times 2} = \frac{59}{48}$$

202. (d)

$$\frac{3(\text{cosec}^2 26° - \tan^2 64°) + (\cot^2 42° - \sec^2 48°)}{\cot(22° - \theta) - \text{cosec}^2(62° + \theta) - \tan(\theta + 68°) + \tan^2(28° - \theta)}$$

$$= \frac{3[(\text{cosec}^2 26° - \tan^2(90° - 26°)] + (\cot^2 42° - \sec^2(90° - 42°))}{\cot(22° - \theta) - \tan[90° - (22° - \theta)] - \text{cosec}^2(62° + \theta) + \tan^2[90° - (62° + \theta)]}$$

$$= \frac{3[(\text{cosec}^2 26°) - (\cot^2 26°)] + (\cot^2 42° - \text{cosec}^2 42°)}{\cot(22° - \theta) - \cot(22° - \theta) - \text{cosec}^2(62° + \theta) + \cot^2(62° + \theta)}$$

$$= \frac{3(1) + (-1)}{-1} = \frac{2}{-1} = -2$$

Alternate Method:-

Put θ = 0°

$$\frac{3(\text{cosec}^2 26° - \tan^2 64°) + \cot^2 42 - \sec^2 48°}{\cot 22° - \text{cosec}^2 62° - \tan 68° + \tan^2 28°}$$

$$= \frac{3(\sec^2 64° - \tan^2 64°) + (\tan^2 48° - \sec^2 48°)}{-\text{cosec}^2 62° + \cot^2 62°}$$

$$= \frac{3-1}{-1} = -2$$

203. (d)

$$\frac{(\cos 9° + \sin 81°)(\sec 9° + \text{cosec} 81°)}{\text{cosec}^2 71° + \cos^2 15° - \tan^2 19° + \cos^2 75°}$$

$$= \frac{[\cos 9° + \sin(90° - 9°)][\sec 9° + \text{cosec}(90° - 9°)]}{\text{cosec}^2 71° - \tan^2(90° - 71°) + \cos^2(90° - 15°) + \cos^2 75°}$$

$$= \frac{(\cos 9° + \cos 9°)(\sec 9° + \sec 9°)}{\text{cosec}^2 71° - \cot^2 71° + \cos^2 15° + \sin^2 15°}$$

$$= \frac{2\cos 9° \times 2\sec 9°}{1+1} = \frac{4}{2} = 2$$

204. (d) Incorrect formula in the given options is, $\sec^2\theta + \cos^2\theta = 1$

205. (c) we know that.

$\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow \sec^2\theta = 1 + \tan^2\theta$

so, option (c) satisfied

206. (c) We know,

$\sec^2\theta + \cos^2\theta \neq 1$

207. (a) $\tan^2 A = 1 - \sec^2 A$ (False)

208. (b) $\sec\theta\sqrt{1 - \sin^2\theta}$

$= \sec\theta\sqrt{\cos^2\theta}$

$= \sec\theta \times \cos\theta = 1$

209. (c) $\therefore \sec^2\theta\left(\sqrt{1 - \sin^2\theta}\right)$

$= \sec^2\theta \times \cos\theta = \sec\theta$

210. (c) $\frac{1}{\tan\theta} + \tan\theta$

$$= \frac{1 + \tan^2\theta}{\tan\theta}$$

$$= \frac{\sec^2\theta}{\tan\theta} = \frac{\cos\theta}{\cos^2\theta \times \sin\theta}$$

$$= \frac{1}{\cos\theta \sin\theta} = \sec\theta\ \text{cosec}\theta$$

Alternate Method:

Put, θ = 45°

$$\frac{1}{\tan 45°} + \tan 45° = 1 + 1 = 2$$

By options,

$\sec\theta \times \text{cosec}\theta = \sec 45°\ \text{cosec} 45°$

$= \sqrt{2} \times \sqrt{2} = 2$

211. (d) $\frac{\cos^2 A}{1 + \sin A} = \frac{1 - \sin^2 A}{1 + \sin A}$

$$= \frac{(1 - \sin A)(1 + \sin A)}{1 + \sin A} = 1 - \sin A$$

212. (a) $\frac{1 + \sin A}{\cos^2 A} = \frac{1 + \sin A}{1 - \sin^2 A}$

$$= \frac{(1 + \sin A)}{(1 + \sin A)(1 - \sin A)} = \frac{1}{(1 - \sin A)}$$

213. (b) $\left[\frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}\right]$

$$= \frac{\cos^2\theta + \sin^2\theta}{\sin\theta\cos\theta} = \frac{1}{\sin\theta\cos\theta}$$

$= \text{cosec}\theta\ \sec\theta$

Alternate Method:

Put θ = 45°,

$$\frac{\cos 45°}{\sin 45°} + \frac{\sin 45°}{\cos 45°} = 1 + 1 = 2$$

Go through options,

$\sec\theta\ \text{cosec}\theta = \sec 45° \times \text{cosec} 45°$

$= \sqrt{2} \times \sqrt{2} = 2$

214. (d) $\frac{32}{\sec^2\theta} - \frac{20}{1 + \tan^2\theta} + 12\sin^2\theta$

$= 32\cos^2\theta - 20\cos^2\theta + 12\sin^2\theta$

$= 12(\cos^2\theta + \sin^2\theta) = 12$

SMART APPROACH:-

$$\text{Triplet} = \begin{matrix} (3, & 4, & 5) \\ \downarrow & \downarrow & \downarrow \\ P & B & H \end{matrix}$$

$$\left(\frac{1}{\sin\theta} + \frac{1}{\tan\theta}\right)\left(\frac{1}{\sin\theta} - \frac{1}{\tan\theta}\right)$$

$$= \left(\frac{5}{3} + \frac{4}{3}\right)\left(\frac{5}{3} - \frac{4}{3}\right) = \frac{9}{3} \times \frac{1}{3} = 1$$

215. (b) $\frac{2\sin\theta}{2\sqrt{1 - \sin^2\theta}} = \frac{\sin\theta}{\cos\theta} = \tan\theta$

216. (a) $(1 + \cot^2\theta)(1 - \cos\theta)(1 + \cos\theta)$

$= (1 + \cot^2\theta)(1 - \cos^2\theta)$

$= \text{cosec}^2\theta \times \sin^2\theta = 1$

Alternate Method:

Put θ = 45°

$(1 + \cot^2 45°)(1 - \cos^2 45°) = (1 + 1)\left(1 - \frac{1}{2}\right) = 2 \times \frac{1}{2} = 1$

217. (d) $(\text{cosec} A + \cot A)(1 - \cos A)$

$$= \left(\frac{1}{\sin A} + \frac{\cos A}{\sin A}\right)(1 - \cos A)$$

$$= \frac{(1 + \cos A)}{\sin A} \times (1 - \cos A)$$

$$= \frac{1 - \cos^2 A}{\sin A} = \frac{\sin^2 A}{\sin A} = \sin A$$

Alternate Method:

Put A = 30°

$(\text{cosec} 30° + \cot 30°)(1 - \cos 30°)$

$$= (2 + \sqrt{3})\left(1 - \frac{\sqrt{3}}{2}\right) = (2 + \sqrt{3})\frac{(2 - \sqrt{3})}{2} = \frac{1}{2}$$

Go through options,

$\sin 30° = \frac{1}{2}$

218. (c) $\sec A - \cos A = \frac{1}{\cos A} - \cos A$

$= \frac{1-\cos^2 A}{\cos A} = \frac{\sin^2 A}{\cos A}$

$= \frac{\sin A}{\cos A}\sin A$

$= \tan A \sin A$

Alternate Method:

Put $A = 60°$,

$\sec 60° - \cos 60° = 2 - \frac{1}{2} = \frac{3}{2}$

Go through options,

$\tan A \sin A = \tan 60° \times \sin 60°$

$= \sqrt{3} \times \frac{\sqrt{3}}{2} = \frac{3}{2}$

219. (b) $1 - \frac{\tan^2\phi}{\sec^2\phi} = \frac{\sec^2\phi - \tan^2\phi}{\sec^2\phi} = \cos^2\phi$

Go through option,

$\cot^2\phi \sin^2\phi = \frac{\cos^2\phi}{\sin^2\phi} \times \sin^2\phi = \cos^2\phi$

220. (d) ATQ,

$(\operatorname{cosec}^2 B - 1)(\sec^2 B - 1)$

$= \cot^2 B \times \tan^2 B = 1$

221. (b) $\cos^4 A - \sin^4 A$

$= (\cos^2 A - \sin^2 A)(\cos^2 A + \sin^2 A)$

$= (\cos^2 A - \sin^2 A)$

$= (1 - \sin^2 A - \sin^2 A) = (1 - 2\sin^2 A)$

Alternate Method:

Put $\theta = 0°$

$\Rightarrow \cos^4 0° - \sin^4 0° = 1 - 0 = 1$

Go through options,

$1 - 2\sin^2 0° = 1 - 0 = 1$

222. (d) $\operatorname{cosec}\theta\,(1-\cos\theta)(\operatorname{cosec}\theta + \cot\theta)$

$= \operatorname{cosec}\theta\,(1-\cos\theta)\left(\frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}\right)$

$= \operatorname{cosec}\theta\,(1-\cos\theta)\left(\frac{1+\cos\theta}{\sin\theta}\right)$

$= \operatorname{cosec}\theta \times \frac{1-\cos^2\theta}{\sin\theta}$

$= \operatorname{cosec}\theta \times \frac{\sin^2\theta}{\sin\theta} = \operatorname{cosec}\theta \times \sin\theta = 1$

223. (b) $(1 - \cos^2 A)\sec^2 A$

$= \sin^2 A \times \sec^2 A = \tan^2 A$

224. (a) $\sec x - \cos x$

$= \frac{1}{\cos x} - \cos x$

$= \frac{1-\cos^2 x}{\cos x} = \frac{\sin^2 x}{\cos x} = \frac{\sin x \times \sin x}{\cos x}$

$= \tan x \sin x$

SMART APPROACH:-

We know, Triplet

$$\begin{matrix} P & B & H \\ \downarrow & \downarrow & \downarrow \\ 3 & 4 & 5 \end{matrix}$$

$\sec x - \cos x$

$= \frac{5}{4} - \frac{4}{5} = \frac{9}{20}$

option (a) = $\tan x \sin x$

$= \frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$ (Satisfied)

225. (a) $\frac{1}{1+\cos\theta} + \frac{1}{1-\cos\theta}$

$= \frac{1-\cos\theta+1+\cos\theta}{1-\cos^2\theta} = \frac{2}{\sin^2\theta}$

$= 2\operatorname{cosec}^2\theta$

226. (a)

$\frac{1}{1-\sin\theta} + \frac{1}{1+\sin\theta} = 4\sec\theta$

$\Rightarrow \frac{2}{1-\sin^2\theta} = \frac{4}{\cos\theta}$

$\Rightarrow \frac{2}{\cos^2\theta} = \frac{4}{\cos\theta}$

$\Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

$\therefore \cot 60° + \operatorname{cosec} 60° = \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}}$

$= \frac{3}{\sqrt{3}} = \sqrt{3}$

227. (c) $1 - \sin^2 32° + \frac{1}{1+\tan^2 58}$

$= \cos^2 32° + \frac{1}{\sec^2 58}$

$= \cos^2 32° + \cos^2 58° = 1$

Note: $\cos^2\alpha + \cos^2\beta = 1$

When, $\alpha + \beta = 90°$

228. (c) $\left(\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta}\right)\left(\frac{1}{\tan\theta + \cot\theta}\right)$

$= \left(\frac{\sin^2\theta + 1 + \cos^2\theta + 2\cos\theta}{\sin\theta(1+\cos\theta)}\right)$

$(\sin\theta\cos\theta)$

$= \left(\frac{2+2\cos\theta}{\sin\theta(1+\cos\theta)}\right) \times \sin\theta\cos\theta$

$= 2\cos\theta$

229. (c) Put $\theta = 45°$

Now,

$\frac{5}{1+\cot^2 45°} + \frac{3}{1+\tan^2 45°} + 2\cos^2 45°$

$= \frac{5}{2} + \frac{3}{2} + 2 \times \frac{1}{2} = 4 + 1 = 5$

Alternate Method:

$\frac{5}{1+\cot^2\theta} + \frac{3}{1+\tan^2\theta} + 2\cos^2\theta$

$= \frac{5}{\operatorname{cosec}^2\theta} + \frac{3}{\sec^2\theta} + 2\cos^2\theta$

$= 5\sin^2\theta + 3\cos^2\theta + 2\cos^2\theta$

$= 5(\sin^2\theta + \cos^2\theta) = 5$

230. (a) $\frac{1+\sin A}{\cos A} + \frac{\cos A}{1+\sin A}$

$= \frac{1+\sin^2 A + 2\sin A + \cos^2 A}{\cos A(1+\sin A)}$

$= \frac{2(1+\sin A)}{\cos A(1+\sin A)}$

$= 2\sec A$

231. (a) $\frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A}$

$= \frac{\sin^2 A + (1+\cos A)^2}{\sin A(1+\cos A)}$

$= \frac{\sin^2 A + 1 + 2\cos A + \cos^2 A}{\sin A(1+\cos A)}$

$= \frac{2(1+\cos A)}{\sin A(1+\cos A)} = 2\operatorname{cosec} A$

Alternate Method:

Put $A = 30°$

$\frac{\sin 30°}{1+\cos 30°} + \frac{1+\cos 30°}{\sin 30°}$

$= \frac{\frac{1}{2}}{1+\frac{\sqrt{3}}{2}} + \frac{1+\frac{\sqrt{3}}{2}}{\frac{1}{2}}$

$= \frac{\frac{1}{2}\times 2}{\sqrt{3}+2} + \frac{2+\sqrt{3}}{1} = \frac{1}{2+\sqrt{3}} + 2 + \sqrt{3}$

$= 2 - \sqrt{3} + 2 + \sqrt{3} = 4$

Go through options,

$2\operatorname{cosec}\theta = 2\operatorname{cosec} 30° = 2 \times 2 = 4$

232. (d) $\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} + 2$

$= \frac{\cos^2 A + (1+\sin A)^2}{\cos A(1+\sin A)} + 2$

$= \frac{\cos^2 A + 1 + \sin^2 A + 2\sin A}{\cos A(1+\sin A)} + 2$

$= \frac{2(1+\sin A)}{\cos A(1+\sin A)} + 2 = 2(\sec A + 1)$

233. (a) $3(\sec^2 A - 1)(\operatorname{cosec} A - 1)(\operatorname{cosec} A + 1) + 4(\operatorname{cosec}^2 A - \cot^2 A)$

$= 3\tan^2 A(\operatorname{cosec}^2 A - 1) + 4 \times 1$

$= 3\tan^2 A \times \cot^2 A + 4 = 3 + 4 = 7$

$$\left[\begin{array}{l} \because \sec^2 A - 1 = \tan^2 A \\ \operatorname{cosec}^2 A - \cot^2 A = 1 \\ \tan^2 A \times \cot^2 A = 1 \end{array}\right]$$

Alternate Method:-

Put $A = 45°$

$3(\sec^2 45° - 1)(\operatorname{cosec} 45° - 1)(\operatorname{cosec} 45° + 1) + 4(\operatorname{cosec}^2 45° - \cot^2 45°)$

$= 3(2-1)(\sqrt{2}-1)(\sqrt{2}+1) + 4(2-1) = 3 \times 1 + 4 = 7$

234. (a) $(1 + \tan^2\theta) + \left[1 + \frac{1}{\tan^2\theta}\right] = k$

put, $\theta = 45°$

$\Rightarrow (1 + \tan^2 45°) + \left[1 + \frac{1}{\tan^2 45°}\right] = k$

$\Rightarrow (1 + 1) + \left[1 + \frac{1}{1}\right] = k$

$\Rightarrow 4 = k$

$\Rightarrow \sqrt{k} = \sqrt{4} = 2$

Go through option.

$\because \operatorname{cosec}\theta \sec\theta$

$= \operatorname{cosec} 45° \sec 45° = \sqrt{2} \times \sqrt{2} = 2$

235. (d) $\left(\frac{1}{\sin\theta}+\frac{1}{\tan\theta}\right)\left(\frac{1}{\sin\theta}-\frac{1}{\tan\theta}\right)$

$= \frac{1}{\sin^2\theta}-\frac{1}{\tan^2\theta}$

$\Rightarrow \text{cosec}^2\theta - \cot^2\theta = 1$

236. (c) $(\sin\theta + \text{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2$

$= \sin^2\theta + \text{cosec}^2\theta + 2 + \cos^2\theta + \sec^2\theta + 2$

$= 1 + 1 + \tan^2\theta + 1 + \cot^2\theta + 4$

$= 7 + \tan^2\theta + \cot^2\theta$

Alternate Method:

$(\sin\theta + \text{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2$

Put $\theta = 45°$

$\left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2+\left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2=\left(\frac{3}{\sqrt{2}}\right)^2+\left(\frac{3}{\sqrt{2}}\right)^2$

$=\frac{9}{2}+\frac{9}{2}=9$

Go through options,

$7 + \tan^2\theta + \cot^2\theta = 7 + \tan^2 45° + \cot^2 45° = 7 + 1 + 1 = 9$

237. (c) $\sin^2\theta\cos^2\theta = \frac{2}{9}$

$\therefore \text{cosec}^2\theta+\sec^2\theta=\frac{1}{\sin^2\theta}+\frac{1}{\cos^2\theta}$

$=\frac{1}{\sin^2\theta\cos^2\theta}=\frac{9}{2}$

Alternate Method:

$\sin^2\theta \times \cos^2\theta = \frac{2}{3}\times\frac{1}{3}$

$\therefore \text{cosec}^2\theta + \sec^2\theta = \frac{3}{2}+3=\frac{9}{2}$

238. (a) Given, $\sec\theta - \cos\theta = 14$

$14\sec\theta = x$

Now,

$\sec\theta - \frac{1}{\sec\theta} = 14$

$\Rightarrow \sec^2\theta - 1 = 14\sec\theta$

$\Rightarrow x = \tan^2\theta$ ($\because \sec^2\theta - 1 = \tan^2\theta$)

239. (c) $\frac{\cos^4\theta-\sin^4\theta}{\sin^2\theta}$

$=\frac{(\cos^2\theta-\sin^2\theta)(\cos^2\theta+\sin^2\theta)}{\sin^2\theta}$

$=\frac{\cos^2\theta-\sin^2\theta}{\sin^2\theta}$

$=\frac{\cos^2\theta}{\sin^2\theta}-\frac{\sin^2\theta}{\sin^2\theta}=\cot^2\theta-1$

Alternate Method:

Put $\theta = 30°$

$\frac{\cos^4 30°-\sin^4 30°}{\sin^2 30°}=\frac{\frac{9}{16}-\frac{1}{16}}{\frac{1}{4}}$

$=\frac{8}{16}\times 4=2$

Go through options,

$\cot^2 30° - 1 = 3 - 1 = 2$

240. (b) Given

$\cos^4\alpha-\sin^4\alpha=\frac{5}{6}$

$\Rightarrow (\cos^2\alpha-\sin^2\alpha)(\cos^2\alpha+\sin^2\alpha)=\frac{5}{6}$

$\Rightarrow (\cos^2\alpha-\sin^2\alpha)(1)=\frac{5}{6}$

$\Rightarrow \cos^2\alpha-(1-\cos^2\alpha)=\frac{5}{6}$

$\Rightarrow 2\cos^2\alpha-1=\frac{5}{6}$

241. (c) $\frac{(1+\tan^2 A)}{\text{cosec}^2 A.\tan A}=\frac{\sec^2 A}{\text{cosec}^2 A\times\tan A}$

$=\frac{\frac{1}{\cos^2 A}}{\frac{1}{\sin^2 A}\times\tan A}=\frac{\sin^2 A}{\cos^2 A\times\tan A}$

$=\frac{\tan^2 A}{\tan A}=\tan A$

Alternate Method:

Put $\theta = 60°$

$\Rightarrow \frac{1+\tan^2 60°}{\text{cosec}^2 60°\times\tan 60°}$

$=\frac{1+3}{\left(\frac{2}{\sqrt{3}}\right)^2\times\sqrt{3}}=\frac{4}{\frac{4}{3}\times\sqrt{3}}=\frac{4\times 3}{4\sqrt{3}}=\sqrt{3}$

Go through options,

$\tan 60° = \sqrt{3}$

242. (b) A.T.Q,

$\frac{\cos\theta}{\sec\theta-1}+\frac{\cos\theta}{\sec\theta+1}$

$=\cos\theta\left[\frac{\sec\theta+1+\sec\theta-1}{(\sec^2\theta-1)}\right]$

$=\frac{\cos\theta\times 2\sec\theta}{\tan^2\theta}=2\cot^2\theta$

243. (a) Given, $\frac{\cos\theta}{(1+\sin\theta)}+\frac{\cos\theta}{(1-\sin\theta)}=4$

$\Rightarrow \frac{\cos\theta[1-\sin\theta+1+\sin\theta]}{\cos^2\theta}=4$

$\Rightarrow \frac{2\cos\theta}{\cos^2\theta}=4 \Rightarrow \sec^2\theta=\sec 60°$

$\Rightarrow \theta = 60°$

244. (a) $\frac{3-\sin^2 A+\cos^2 A}{2+2\cos^2 A}$

$=\frac{2+1-\sin^2 A+\cos^2 A}{2+2\cos^2 A}$

$=\frac{2+2\cos^2 A}{2+2\cos^2 A}=1$

Alternate Method:

Put $A = 0°$

$\Rightarrow \frac{3-\sin^2 0°+\cos^2 0°}{2+2\cos^2 0°}=\frac{3+1}{2+2}=\frac{4}{4}=1$

245. (a) $\frac{\sin^4 A+\cos^4 A}{1-2\sin^2 A\cos^2 A}$

$=\frac{1-2\sin^2 A\cos^2 A}{1-2\sin^2 A\cos^2 A}=1$

Alternate Method:

Let, $A = 90°$

$\frac{\sin^4 A+\cos^4 A}{1-2\sin^2 A\cos^2 A}=\frac{(1)^4+0}{1-0}=1$

246. (d) Given, $\sin\theta\cos\theta=\frac{1}{\sqrt{3}}$

$\therefore \sin^4\theta+\cos^4\theta = 1-2\sin^2\theta\cos^2\theta$

$=1-2\times\left(\frac{1}{\sqrt{3}}\right)^2=\frac{1}{3}$

247. (c) $\frac{1+\sin^4\theta+\cos^4\theta}{\cos^2\theta+\sin^4\theta}$

$=\frac{1+1-2\sin^2\theta\cos^2\theta}{1-\sin^2\theta+\sin^4\theta}$

$=\frac{2-2\sin^2\theta\cos^2\theta}{1-\sin^2\theta(1-\sin^2\theta)}$

$=\frac{2(1-\sin^2\theta\cos^2\theta)}{1-\sin^2\theta\cos^2\theta}=2$

Alternate Method:

Put $\theta = 0 \Rightarrow \frac{1+0+1}{1+0}=\frac{2}{1}=2$

248. (d) $\sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta\cos^2\theta$

$= 1 - 2\sin^2\theta(1 - \sin^2\theta)$

$= 1 - 2\sin^2\theta + 2\sin^4\theta$

$= 2\sin^4\theta - 2\sin^2\theta + 1$

249. (d) $2[\tan^2 A.\cos^2 A + \cos^2 A]$

$= 2\cos^2 A(\tan^2 A + 1)$

$= 2\cos^2 A \times \sec^2 A = 2$

Alternate Method:

Put $A = 45°$,

$\Rightarrow 2(\tan^2 45° \times \cos^2 45° + \cos^2 45°)$

$=2\left(1\times\frac{1}{2}+\frac{1}{2}\right)=2$

250. (d) $\tan\theta=\frac{8}{19}$

$\sec^2\theta = 1 + \tan^2\theta$

$=1+\left(\frac{8}{19}\right)^2=1+\frac{64}{361}=1\frac{64}{361}$

251. (b) Given, $\text{cosec}\theta=\frac{29}{22}$

$\because \cot^2\theta = \text{cosec}^2\theta - 1$

$=\frac{841}{484}-1=\frac{357}{484}$

252. (d) Given, $\cot\theta=\frac{9}{17}$

We know,

$\text{cosec}^2\theta = 1 + \cot^2\theta$

$=1+\frac{81}{289}=1\frac{81}{289}$

253. (a) $\frac{\sin^3 A-\cos^3 A}{\sin A-\cos A}$

$=\frac{(\sin A-\cos A)(\sin^2 A+\cos^2 A+\sin A\cos A)}{\sin A-\cos A}$

$= 1 + \sin A\cos A$

254. (d) $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$

$\therefore \frac{\sin^3 A+\cos^3 A}{\sin A+\cos A}$

$=\frac{(\sin A+\cos A)(\sin^2 A+\cos^2 A-\sin A\times\cos A)}{(\sin A+\cos A)}$

$= 1 - \sin A\cos A$

255. (b) $\frac{\cot^3 A-1}{\cot A-1}$

$=\frac{(\cot A-1)(\cot^2 A+1+\cot A)}{(\cot A-1)}$

$= \cot^2 A + 1 + \cot A$

$= \cot^2 A + \text{cosec}^2 A - \cot^2 A + \cot A$

$= \text{cosec}^2 A + \cot A$

256. (c) $\frac{\sin^3\alpha+\cos^3\alpha}{\sin\alpha+\cos\alpha}$

$=\frac{(\sin\alpha+\cos\alpha)(\sin^2\alpha+\cos^2\alpha-\sin\alpha.\cos\alpha)}{(\sin\alpha+\cos\alpha)}$

$=(1-\sin\alpha.\cos\alpha)$

257. (a) $(a^3 + b^3) = (a + b)(a^2 + b^2 - ab)$

Now,

$(\sin A + \cos A)(1 - \sin A \cos A)$

$= (\sin A + \cos A)(\sin^2 A + \cos^2 A - \sin A \cos A)$ $[\because \sin^2 A + \cos^2 A = 1]$

$= \sin^3 A + \cos^3 A$

258. (b) $\sin^6\theta + \cos^6\theta = \frac{1}{3}$

$\Rightarrow 1 - 3\sin^2\theta\cos^2\theta = \frac{1}{3}$

$\Rightarrow 3\sin^2\theta\cos^2\theta = 1 - \frac{1}{3} = \frac{2}{3}$

$\Rightarrow \sin\theta\cos\theta = \frac{\sqrt{2}}{3}$

259. (b) $\frac{1}{\sin\theta} - \frac{\cot^2\theta}{1 + \operatorname{cosec}\theta}$

$= \frac{1}{\sin\theta} - \frac{(\operatorname{cosec}\theta - 1)(\operatorname{cosec}\theta + 1)}{(\operatorname{cosec}\theta + 1)}$

$= \operatorname{cosec}\theta - \operatorname{cosec}\theta + 1 = 1$

Alternate Method:

Put $\theta = 45°$,

$\Rightarrow \frac{1}{\sin 45°} - \frac{\cot^2 45°}{1 + \operatorname{cosec} 45°} = \sqrt{2} - \frac{1}{1 + \sqrt{2}}$

$= \frac{\sqrt{2} + 2 - 1}{\sqrt{2} + 1} = \frac{\sqrt{2} + 1}{\sqrt{2} + 1} = 1$

260. (b) $(1 + \tan^2 A)(1 + \cot^2 A)$

$= \sec^2 A \cdot \operatorname{cosec}^2 A$

$= \frac{1}{\cos^2 A} \times \frac{1}{\sin^2 A} = \frac{1}{\sin^2 A(1 - \sin^2 A)}$

261. (c) $17\cos^2\theta + 10\sin^2\theta + \frac{7}{\operatorname{cosec}^2\theta}$

$= 17\cos^2\theta + 10\sin^2\theta + 7\sin^2\theta$

$= 17\cos^2\theta + 17\sin^2\theta = 17(\cos^2 + \sin^2\theta)$

$= 17 \times 1 = 17$

262. (a) $\frac{1 + \tan^2 A}{\tan^2 A} = \frac{1}{\tan^2 A} + 1 = \cot^2 A + 1 = \operatorname{cosec}^2 A \neq \sin^2 A$

263. (d) $\tan^2\theta + \tan^4\theta$

$= \tan^2\theta(1 + \tan^2\theta)$

$= \tan^2\theta . \sec^2\theta = (\sec^2\theta - 1)\sec^2\theta$

$= \sec^4\theta - \sec^2\theta$

Alternate Method:

Put $\theta = 45°$

$\tan^2 45° + \tan^4 45° = 1 + 1 = 2$

Go through options,

$\sec^4\theta - \sec^2\theta = \sec^4 45° - \sec^2 45°$

$= (\sqrt{2})^4 - (\sqrt{2})^2 = 4 - 2 = 2$

264. (c) $\frac{\cos A}{1 - \sin A} + \frac{\cos A}{1 + \sin A} = 4$

$\Rightarrow \frac{\cos A + \cos A \sin A + \cos A - \cos A \sin A}{1 - \sin^2 A} = 4$

$\Rightarrow \frac{\cos A \times 2}{1 - \sin^2 A} = 4 \Rightarrow \frac{2}{\cos A} = 4$

$\Rightarrow \cos A = \frac{1}{2} \Rightarrow A = 60°$

265. (d) $3\sin^2\theta + 5\cos^2\theta = 4$

$\Rightarrow 3 + 2\cos^2\theta = 4 \Rightarrow \cos^2\theta = \frac{1}{2}$

$\Rightarrow \cos\theta = \frac{1}{\sqrt{2}} = \cos 45°$

$\theta = 45°$

$\therefore \tan 45° = 1$

266. (c) $a = x\cos\theta + y\sin\theta$

$b = x\sin\theta - y\cos\theta$

$a^2 + b^2 = x^2\cos^2\theta + y^2\sin^2\theta + 2xy\sin\theta\cos\theta + x^2\sin^2\theta + y^2\cos^2\theta - 2xy\sin\theta\cos\theta = x^2 + y^2$

Alternate Method:-

Let $\theta = 45°$

$a = \frac{x}{\sqrt{2}} + \frac{y}{\sqrt{2}} = \frac{x + y}{\sqrt{2}}$

$b = \frac{x}{\sqrt{2}} - \frac{y}{\sqrt{2}} = \frac{x - y}{\sqrt{2}}$

$\therefore \quad a^2 + b^2 = \frac{1}{2}[(x + y)^2 + (x - y)^2]$

$= \frac{1}{2} \times 2(x^2 + y^2) = x^2 + y^2$

267. (a) $(\sec\phi - \tan\phi)^2(1 + \sin\phi)^2 \div \cos^2\phi$

Put, $\phi = 45°$

$(\sec 45° - \tan 45°)^2(1 + \sin 45°)^2 \div \cos^2 45°$

$= (\sqrt{2} - 1)^2\left(1 + \frac{1}{\sqrt{2}}\right)^2 \div \left(\frac{1}{\sqrt{2}}\right)^2$

$= (\sqrt{2} - 1)^2\left(\frac{\sqrt{2} + 1}{\sqrt{2}}\right)^2 \div \frac{1}{2}$

$= \frac{(9 - 8)^2}{2} \times 2 = \frac{1}{2} \times 2 = 1$

268. (b) Given,

$p\cos A = 2q\sin A$ ......(i)

and $2p\operatorname{cosec} A - q\sec A = 3$ ......(ii)

Let, $A = 45°$

By equation (i)

$p \times \frac{1}{\sqrt{2}} = 2q \times \frac{1}{\sqrt{2}}$

$\Rightarrow p = 2q$

By equation (ii)

$2p \times \sqrt{2} - q\sqrt{2} = 3$

$\Rightarrow 4q\sqrt{2} - \sqrt{2}q = 3$

$\Rightarrow 3\sqrt{2}q = 3$

$\Rightarrow q = \frac{1}{\sqrt{2}} \Rightarrow p = \sqrt{2}$

$\therefore p^2 + 4q^2 = 2 + 4 \times \frac{1}{2} = 4$

Alternate Method:-

$p\cos A = 2q\sin A$

$\Rightarrow p = 2q\tan A$ ....(i)

Also,

$2p\operatorname{cosec} A - q\sec A = 3$

$\Rightarrow 4q\tan A \times \operatorname{cosec} A - q\sec A = 3$

$\Rightarrow 4q\sec A - q\sec A = 3$

$\Rightarrow q = \cos A$ ....(ii)

$\Rightarrow p = 2\sin A$

$\therefore p^2 + 4q^2 = 4\sin^2 A + 4\cos^2 A = 4(\sin^2 A + \cos^2 A) = 4$

269. (b) $x = r\cos(t)$

$y = r\sin(t)\cos(u)$

$z = r\sin(t)\sin(u)$

Let, $t = 45°$, $u = 30°$

$\Rightarrow x = \frac{r}{\sqrt{2}}, y = \frac{r}{\sqrt{2}} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}r}{2\sqrt{2}}$

and, $z = \frac{r}{\sqrt{2}} \times \frac{1}{2} = \frac{r}{2\sqrt{2}}$

$\therefore x^2 + y^2 + z^2 = \frac{r^2}{2} + \frac{3r^2}{8} + \frac{r^2}{8}$

$= \frac{(4 + 3 + 1)r^2}{8} = r^2$

Alternate Method:

$x^2 + y^2 + z^2 = r^2\cos^2 t + r^2\sin^2 t\cos^2 u + r^2\sin^2 t\sin^2 u$

$= r^2[\cos^2 t + \sin^2 t\cos^2 u + \sin^2 t\sin^2 u]$

$= r^2[\cos^2 t + \sin^2 t(\cos^2 u + \sin^2 u)]$

$= r^2[\cos^2 t + \sin^2 t] = r^2$

270. (c) $\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta}$

$= \frac{\sin\theta}{1 - \cos\theta} - \frac{1}{\sin\theta}$

$= \frac{\sin^2\theta - 1 + \cos\theta}{\sin\theta(1 - \cos\theta)}$

$= \frac{-\cos^2\theta + \cos\theta}{\sin\theta(1 - \cos\theta)} = \frac{\cos\theta(-\cos + 1)}{\sin\theta(1 - \cos\theta)}$

$= \cot\theta.$

Alternate Method:

$\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta}$

Put, $\theta = 30°$

$\frac{1}{\operatorname{cosec} 30° - \cot 30°} - \frac{1}{\sin 30°} = \frac{1}{2 - \sqrt{3}} - 2$

$= 2 + \sqrt{3} - 2 = \sqrt{3}$

$\therefore \cot\theta = \cot 30° = \sqrt{3}$

271. (b) $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$= \sin^2 A + \operatorname{cosec}^2 A + 2 \times \sin A \times \operatorname{cosec} A + \cos^2 A + \sec^2 A + 2 \times \cos A \times \sec A$

$= 1 + 2 + 2 + \tan^2 A + 1 + \cot^2 A + 1$

$= 7 + \tan^2 A + \cot^2 A$

Alternate Method:

By value putting $A = 45°$

$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$= (\sin 45° + \operatorname{cosec} 45°)^2 + (\cos 45° + \sec 45°)^2$

$= \left(\frac{1}{\sqrt{2}} + \sqrt{2}\right)^2 + \left(\frac{1}{\sqrt{2}} + \sqrt{2}\right)^2$

$= \left(\frac{3}{\sqrt{2}}\right)^2 + \left(\frac{3}{\sqrt{2}}\right)^2$

$= \frac{9}{2} + \frac{9}{2} = \frac{18}{2} = 9$

Now, check option (b)

$7 + \tan^2 A + \cot^2 A = 7 + \tan^2 45° + \cot^2 45° = 7 + 1 + 1 = 9$

Hence, $A = 45°$ satisfy so, option 'b' will be the answer.

272. (d) $\frac{1 - \cot^2\theta}{\tan^2\theta - 1}$

$= \frac{1 - \frac{\cos^2\theta}{\sin^2\theta}}{\frac{\sin^2\theta}{\cos^2\theta} - 1} = \frac{\frac{\sin^2\theta - \cos^2\theta}{\sin^2\theta}}{\frac{\sin^2\theta - \cos^2\theta}{\cos^2\theta}} = \frac{\cos^2\theta}{\sin^2\theta}$

$= \cot^2\theta$

Alternate Method:

Put θ = 30°

$$\therefore \frac{1-\cot^2\theta}{\tan^2\theta-1} = \frac{1-(\cot 30°)^2}{(\tan 30°)^2-1}$$

$$= \frac{1-3}{\frac{1}{3}-1} = \frac{-2}{-2/3} = 3 = \cot^2 30° = \cot^2\theta$$

273. (c) $\frac{3\sin\theta-\cos\theta}{\cos\theta+\sin\theta} = 1$

On dividing Nr and Dn by sinθ

$$\Rightarrow \left(\frac{\frac{3\sin\theta-\cos\theta}{\sin\theta}}{\frac{\cos\theta+\sin\theta}{\sin\theta}}\right) = 1$$

$$\Rightarrow \frac{3-\cot\theta}{\cot\theta+1} = 1$$

$\Rightarrow 3 - \cot\theta = \cot\theta + 1 \Rightarrow \cot\theta = 1$

274. (b) $\frac{\sin x-\cos x}{\sin x+\cos x} = \frac{2}{5}$

On dividing numerator and denominator by sinx

$$\Rightarrow \frac{\frac{\sin x}{\sin x}-\frac{\cos x}{\sin x}}{\frac{\sin x}{\sin x}+\frac{\cos x}{\sin x}} = \frac{2}{5}$$

$$\Rightarrow \frac{1-\cot x}{1+\cot x} = \frac{2}{5}$$

$\Rightarrow 5 - 5\cot x = 2 + 2\cot x$

$\Rightarrow 7\cot x = 3 \Rightarrow \cot x = \frac{3}{7}$

$$\therefore \frac{1+\cot^2 x}{1-\cot^2 x} = \frac{1+\left(\frac{3}{7}\right)^2}{1-\left(\frac{3}{7}\right)^2}$$

$$= \frac{1+\frac{9}{49}}{1-\frac{9}{49}} = \frac{\frac{58}{49}}{\frac{40}{49}} = \frac{58}{40} = 1.45$$

275. (a) $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = k + \tan^2\theta + \cot^2\theta$

$\Rightarrow \sin^2\theta + \operatorname{cosec}^2\theta + 2 + \cos^2\theta + \sec^2\theta + 2 = k + \tan^2\theta + \cot^2\theta$

$\Rightarrow 1 + 2 + 1 + \cot^2\theta + 1 + \tan^2\theta + 2 = k + \tan^2\theta + \cot^2\theta$

$\Rightarrow 1 + 2 + 2 + 1 + 1 = k$

$\Rightarrow k = 7$

Alternate Method:-

Put θ = 45°

$$\left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2 + \left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2 = k + 1 + 1$$

$$\Rightarrow \frac{9}{2}+\frac{9}{2} = k + 2$$

$\Rightarrow 9 = k + 2 \Rightarrow k = 7$

276. (c) $1 + \sin^2\theta = a\cos^2\theta$

divide by $\cos^2\theta$ both side,

$\sec^2\theta + \tan^2\theta = a$

277. (c) $m + 5 = \sec^2 A\operatorname{cosec}^2 A(\sin^2 A)\cos^2 A + 5$

$$\boxed{\begin{array}{l} 1-\cos^2 A = \sin^2 A \\ 1-\sin^2 A = \cos^2 A \end{array}}$$

$\Rightarrow m + 5 = 1 + 5$

$\therefore m = 1$

278. (a) $\frac{x}{p} = \sec A.\cos B$ ....(i)

$\frac{y}{q} = \sec A.\sin B$ ....(ii)

$\frac{z}{r} = \tan A$ ....(iii)

On squaring both sides in all three equation

$\frac{x^2}{p^2} = \sec^2 A.\cos^2 B$ ....(iv)

$\frac{y^2}{q^2} = \sec^2 A.\sin^2 B$ ....(v)

$\frac{z^2}{r^2} = \tan^2 A$ ....(vi)

Now, (iv) + (v) – (vi)

$$\frac{x^2}{p^2}+\frac{y^2}{q^2}-\frac{z^2}{r^2}$$

$$= \frac{\cos^2 B}{\cos^2 A}+\frac{\sin^2 B}{\cos^2 A}-\frac{\sin^2 A}{\cos^2 A}$$

$$= \frac{1-\sin^2 A}{\cos^2 A} = \frac{\cos^2 A}{\cos^2 A} = 1$$

Alternate Method:-

Let, A = B = 45°

$\Rightarrow x = p, y = q, z = r$

$$\therefore \frac{x^2}{p^2}+\frac{y^2}{q^2}-\frac{z^2}{r^2} = 1 + 1 - 1 = 1$$

279. (b) $x = a\sec\theta\cos\phi, y = b\sec\theta\sin\phi$ and $z = c\tan\theta$

Let, θ = 45°, ϕ = 30°

$$\Rightarrow x = a \times \sqrt{2} \times \frac{\sqrt{3}}{2} = \frac{a\sqrt{6}}{2} = a\frac{\sqrt{3}}{\sqrt{2}}$$

$$\Rightarrow y = b \times \sqrt{2} \times \frac{1}{2} = \frac{b}{\sqrt{2}}$$

and z = c

$$\therefore \frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}$$

$$= \frac{a^2\times\frac{3}{2}}{a^2}+\frac{\frac{b^2}{2}}{b^2}-\frac{c^2}{c^2} = \frac{3}{2}+\frac{1}{2}-1 = 1$$

Alternate Method:

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2} = \frac{a^2\sec^2\theta\cos^2\phi}{a^2} + \frac{b^2\sec^2\theta\sin^2\phi}{b^2} - \frac{c^2\tan^2\theta}{c^2}$$

$= \sec^2\theta(\cos^2\phi + \sin^2\phi) - \tan^2\theta$

$= \sec^2\theta - \tan^2\theta = 1$

280. (c) $\tan\theta = \frac{5}{8}$

$$\therefore \frac{(1+\cos\theta)(1-\cos\theta)}{(1+\sin\theta)(1-\sin\theta)} = \frac{1-\cos^2\theta}{1-\sin^2\theta}$$

$$= \frac{\sin^2\theta}{\cos^2\theta} = \tan^2\theta = \left(\frac{5}{8}\right)^2 = \frac{25}{64}$$

281. (c) $\frac{3\cos^3\theta-2\cos\theta}{\sin\theta-3\sin^3\theta}$

$$= \frac{\cos\theta(3\cos^2\theta-2)}{\sin\theta(1-3\sin^2\theta)}$$

$$= \frac{\cos\theta(1-3\sin^2\theta)}{\sin\theta(1-3\sin^2\theta)} = \cot\theta$$

282. (d) $\frac{3(\sin^4 z-\cos^4 z+1)}{\sin^2 z}$

$$= \frac{3(\sin^2 z-\cos^2 z+1)}{\sin^2 z}$$

We know, $(\cos^2 z = 1 - \sin^2 z)$

$$= \frac{3(2\sin^2 z)}{\sin^2 z} = 3 \times 2 = 6$$

Alternate Method:

Put z = 90°

$$\frac{3(\sin^4 90°-\cos^4 90°+1)}{\sin^2 90°} = \frac{3(1-0+1)}{1} = 6$$

283. (b) $\left(\frac{\operatorname{cosec}A}{\operatorname{cosec}A-1}+\frac{\operatorname{cosec}A}{\operatorname{cosec}A+1}\right)$

$$\left(\frac{\sec A}{\sec A-1}+\frac{\sec A}{\sec A+1}\right)^{-1}$$

$$= \left(\frac{\operatorname{cosec}^2 A+\operatorname{cosec}A+\operatorname{cosec}^2 A-\operatorname{cosec}A}{\cot^2 A}\right)$$

$$\left(\frac{\sec^2 A+\sec^2 A}{\tan^2 A}\right)^{-1}$$

$$= \frac{2\operatorname{cosec}^2 A}{\cot^2 A}\times\frac{\tan^2 A}{2\sec^2 A} = \tan^2 A$$

Put A = 60°

$\therefore \tan^2 60° = 3$

284. (a) tan(t) + cot(t) = 1

$$\Rightarrow \frac{\sin t}{\cos t}+\frac{\cos t}{\sin t} = 1 \Rightarrow \frac{1}{\sin t.\cos t} = 1$$

$\Rightarrow \sin t.\cos t = 1$

$\therefore (\sin t + \cos t)^2 = 1 + 2\sin t.\cos t$

$\Rightarrow (\sin t + \cos t)^2 = 1 + 2 \times 1 = 3$

$$\Rightarrow \left(\frac{1}{\sin t+\cot t}\right) = \frac{1}{\sqrt{3}}$$

285. (d) $(\operatorname{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$

$$= \left(\frac{1}{\sin\theta}-\frac{\sin\theta}{1}\right)\left(\frac{1}{\cos\theta}-\frac{\cos\theta}{1}\right)\sec\theta\times\operatorname{cosec}\theta$$

$\therefore [\sin^2\theta + \cos^2\theta = 1$ and $\tan\theta + \cot\theta = \sec\theta \times \operatorname{cosec}\theta]$

$$= \left(\frac{1-\sin^2\theta}{\sin\theta}\right)\left(\frac{1-\cos^2\theta}{\cos\theta}\right)(\sec\theta\times\operatorname{cosec}\theta)$$

$$= \frac{\cos^2\theta}{\sin\theta}\times\frac{\sin^2\theta}{\cos\theta}\times\sec\theta\times\operatorname{cosec}\theta = 1$$

Alternate method:

Put θ = 45°

(cosec45° – sin45°)(sec45° – cos45°)(tan45° + cot45°)

$$= \left(\sqrt{2}-\frac{1}{\sqrt{2}}\right)\left(\sqrt{2}-\frac{1}{\sqrt{2}}\right)(1+1)$$

$$= \frac{1}{\sqrt{2}}\times\frac{1}{\sqrt{2}}\times 2 = \frac{1}{2}\times 2 = 1$$

286. (a) $p - q = \sin\theta + \tan\theta - \tan\theta + \sin\theta = 2\sin\theta$ ... (i)

$p + q = \sin\theta + \tan\theta + \tan\theta - \sin\theta = 2\tan\theta$ ... (ii)

$\Rightarrow pq = \tan^2\theta - \sin^2\theta = \sin^2\theta[\sec^2\theta - 1]$

$\Rightarrow pq = \sin^2\theta.\tan^2\theta$

$\Rightarrow \sqrt{pq} = \sin\theta.\tan\theta$

Multiply both eq.

$\Rightarrow p^2 - q^2 = 4 \times \sin\theta.\tan\theta$

$\Rightarrow p^2 - q^2 = 4\sqrt{pq}$

287. (c) $P\cos\alpha = 3,\quad 4\tan\alpha = Q.$

$$\Rightarrow P \times \frac{1}{\sec\alpha} = 3$$

$$\sec\alpha = \frac{P}{3},\ \tan\alpha = \frac{Q}{4}$$

$$\because \sec^2\alpha - \tan^2\alpha = 1$$

$$\Rightarrow \frac{P^2}{9} - \frac{Q^2}{16} = 1$$

Alternate Method:

Put $\alpha = 45°$,

Then, $P = 3\sqrt{2}$ and $Q = 4$

option 'c' satisfy

288. (a) $(\cos x - \sin x)^2 + (\cos x + \sin x)^2$

$= \cos^2x + \sin^2x - 2\cos x\sin x$

$+ \cos^2x + \sin^2x + 2\cos x\sin x$

$= 2(\cos^2x + \sin^2x) = 2 \times 1 = 2$

289. (b) $\dfrac{1+\sin t}{4-4\sin t} - \dfrac{1-\sin t}{4+4\sin t}$

$$= \frac{1}{4}\left(\frac{1+\sin t}{1-\sin t} - \frac{1-\sin t}{1+\sin t}\right)$$

$$= \frac{1}{4}\left(\frac{(1+\sin t)^2 - (1-\sin t)^2}{1-\sin^2 t}\right)$$

$$= \frac{1}{4} \times \frac{4\sin t}{\cos^2 t} = \tan t\sec t$$

290. (d) $r = 15(\sin\theta + \cos\theta)$

$s = 16(\sin\theta - \cos\theta)$

$\Rightarrow r^2 = 15^2(\sin\theta + \cos\theta)^2$

$\Rightarrow s^2 = 16^2(\sin\theta - \cos\theta)^2$

ATQ,

$$\therefore \frac{r^2}{15^2} + \frac{s^2}{16^2}$$

$$= \frac{15^2(\sin\theta + \cos\theta)^2}{15^2} + \frac{16^2(\sin\theta - \cos\theta)^2}{16^2}$$

$= (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$

$= 2(\sin^2\theta + \cos^2\theta) = 2$

Alternate Method:

$r = 15(\sin\theta + \cos\theta)$, $s = 16(\sin\theta - \cos\theta)$

Put $\theta = 90°$

$r = 15$, $s = 16$

$$\therefore \frac{r^2}{15^2} + \frac{s^2}{16^2} = 1 + 1 = 2$$

291. (b) Given, $\sin m + \sin n = p$ ....(i)

$\cos m + \cos n = q$ ....(ii)

square Eqⁿ (i) & (ii) then add both Eqⁿ

$\Rightarrow 1 + 1 + 2(\sin m.\sin n + \cos m.\cos n) = p^2 + q^2$

$\Rightarrow 2 + 2(\sin m.\sin n + \cos m.\cos n) = p^2 + q^2$

$\Rightarrow \dfrac{p^2 + q^2 - 2}{2} = \sin m.\sin n + \cos m.\cos n$

292. (d) $\dfrac{(1+\cos\theta)^2 + \sin^2\theta}{(\text{cosec}^2\theta - 1) \times \sin^2\theta}$

$$= \frac{1 + \cos^2\theta + 2\cos\theta + \sin^2\theta}{\cot^2\theta \times \sin^2\theta}$$

$$= \frac{2 + 2\cos\theta}{\frac{\cos^2\theta}{\sin^2\theta} \times \sin^2\theta} = \frac{2(1+\cos\theta)}{\cos^2\theta}$$

$= 2\sec\theta(1 + \sec\theta)$

Alternate Method:

Put $\theta = 45°$

$$\frac{(1+\cos 45°)^2 + \sin^2 45°}{(\text{cosec}^2 45° - 1) \times \sin^2 45°}$$

$$= \frac{\left(1 + \frac{1}{\sqrt{2}}\right)^2 + \frac{1}{2}}{\frac{1}{2}} = \left(\frac{(\sqrt{2}+1)^2}{2} + \frac{1}{2}\right) \times 2$$

$= 3 + 2\sqrt{2} + 1 = 4 + 2\sqrt{2}$

Go through option,

$2\sec\theta(1 + \sec\theta) = 2\sec 45°(1 + \sec 45°)$

$= 2\sqrt{2}(1 + \sqrt{2}) = 4 + 2\sqrt{2}$

293. (b) $\sqrt{\dfrac{1}{\cos^2\theta} + \dfrac{1}{\sin^2\theta}} \times \sqrt{\dfrac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta}$

$$= \frac{1}{\cos\theta\sin\theta} \times \sqrt{\sin^2\theta\left(\frac{1-\cos^2\theta}{\cos^2\theta}\right)}$$

$$= \frac{1}{\cos\theta\sin\theta} \times \sin\theta \times \frac{\sin\theta}{\cos\theta}$$

$$= \frac{\sin\theta}{\cos^2\theta} = \sin\theta\sec^2\theta$$

Alternate Method:

$\sqrt{\sec^2\theta + \text{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$

put $\theta = 45°$,

$$= \sqrt{(\sqrt{2})^2 + (\sqrt{2})^2} \times \sqrt{1 - \left(\frac{1}{\sqrt{2}}\right)^2}$$

$$= \sqrt{2+2} \times \sqrt{1 - \frac{1}{2}} = \sqrt{4} \times \frac{1}{\sqrt{2}}$$

$$= 2 \times \frac{1}{\sqrt{2}} = \sqrt{2}$$

Check options, option (b)

$\sin\theta.\sec^2\theta = \sin 45°\sec^2 45°$

$$= \frac{1}{\sqrt{2}}(\sqrt{2})^2 = \frac{1}{\sqrt{2}} \times 2 = \sqrt{2}$$

294. (b)

$$\frac{1}{\sin^4(90° - 2\alpha)} + \frac{1}{\cos^2(90° - 2\alpha) - 1}$$

$$= \frac{1}{\cos^4 2\alpha} + \frac{1}{\sin^2 2\alpha - 1}$$

$$= \frac{1}{\cos^4 2\alpha} - \frac{1}{\cos^2 2\alpha}$$

$$= \frac{1 - \cos^2 2\alpha}{\cos^4 2\alpha} = \frac{\sin^2 2\alpha}{\cos^4 2\alpha}$$

$= \tan^2 2\alpha\sec^2 2\alpha$

295. (a) $(1 + \tan^2A)\left(1 + \dfrac{1}{\tan^2A}\right)$

$= (1 + \tan^2A)(1 + \cot^2A)$

$$= \left(1 + \frac{\sin^2A}{\cos^2A}\right)\left(1 + \frac{\cos^2A}{\sin^2A}\right)$$

$$= \frac{1}{\cos^2A} \times \frac{1}{\sin^2A} = \frac{1}{(1-\sin^2A)(\sin^2A)}$$

$$= \left(\frac{1}{(\sin^2A - \sin^4A)}\right)$$

Alternate Method:

$(1 + \tan^2A)\left(1 + \dfrac{1}{\tan^2A}\right)$

Put, $A = 60°$

$$\Rightarrow (1 + 3)\left(1 + \frac{1}{3}\right) = 4 \times \frac{4}{3} = \frac{16}{3}$$

Option (a), $\left(\dfrac{1}{(\sin^2A - \sin^4A)}\right)$

$$= \left(\frac{1}{(\sin^2 60° - \sin^4 60°)}\right)$$

$$= \frac{1}{\frac{3}{4} - \frac{9}{16}} = \frac{16}{3}$$

296. (b) $\left\{\tan\dfrac{A}{2} + \text{cosec}\dfrac{B+C}{2}\right\}$

$$\left\{\tan\frac{A}{2} - \text{cosec}\frac{B+C}{2}\right\}$$

$$= \tan^2\frac{A}{2} - \text{cosec}^2\frac{B+C}{2}$$

$$= \sec^2\frac{A}{2} - 1 - \text{cosec}^2\frac{B+C}{2}$$

$$= \sec^2\frac{A}{2} - 1 - \text{cosec}^2\left\{90° - \frac{A}{2}\right\}$$

$$= \sec^2\frac{A}{2} - 1 - \sec^2\frac{A}{2} = -1$$

Alternate Method:

$$\left\{\tan\frac{A}{2} + \text{cosec}\frac{B+C}{2}\right\}$$

$$\left\{\tan\frac{A}{2} - \text{cosec}\frac{B+C}{2}\right\}$$

Put $A = 90°$, $B + C = 90°$

$(\tan 45° + \text{cosec}45°)(\tan 45° - \text{cosec}45°)$

$= (1 + \sqrt{2})(1 - \sqrt{2}) = 1 - 2 = -1$

297. (c) $\tan^4A + \tan^2A$

$= \tan^2A(1 + \tan^2A)$

$= \tan^2A.\sec^2A = (\sec^2A - 1).\sec^2A$

$= \sec^4A - \sec^2A$

Alternate Method:

Put $\theta = 45°$

$\tan^4A + \tan^2A = \tan^4 45° + \tan^2 45°$

$= 1 + 1 = 2$

Now, Check option (c)

$\sec^4A - \sec^2A = \sec^4 45° - \sec^2 45°$

$= (\sqrt{2})^4 - (\sqrt{2})^2 = 4 - 2 = 2$

option (c) satisfy the condition

298. (d)

$$\text{cosec}\theta\left[\frac{1+\cos\theta}{\sin\theta} + \frac{\sin\theta}{1+\cos\theta}\right] - 2\cot^2\theta$$

$$= \text{cosec}\theta\left[\frac{1+\cos\theta}{\sin\theta} + \frac{\sin\theta}{1+\cos\theta} \times \frac{1-\cos\theta}{1-\cos\theta}\right] - 2\cot^2\theta$$

$$= \text{cosec}\theta\left[\frac{1+\cos\theta}{\sin\theta} + \frac{\sin\theta(1-\cos\theta)}{\sin^2\theta}\right] - 2\cot^2\theta$$

$[\because 1 - \cos^2\theta = \sin^2\theta,\ \text{cosec}^2\theta - \cot^2\theta = 1]$

$$= \text{cosec}\theta\left[\frac{1 + \cos\theta + 1 - \cos\theta}{\sin\theta}\right] - 2\cot^2\theta$$

$= 2\text{cosec}^2\theta - 2\cot^2\theta$

$= 2(\text{cosec}^2\theta - \cot^2\theta) = 2 \times 1 = 2$

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299. (a) $\sin A\left(1+\frac{\sin A}{\cos A}\right)+\cos A\left(1+\frac{\cos A}{\sin A}\right)$

$=\frac{\sin A}{\cos A}(\cos A+\sin A)+\frac{\cos A}{\sin A}(\sin A+\cos A)$

$=(\cos A+\sin A)\left(\frac{\sin A}{\cos A}+\frac{\cos A}{\sin A}\right)$

$=\frac{\cos A+\sin A}{\sin A\times\cos A}=\sec A+\operatorname{cosec} A$

Alternate Method:

Put A = 45°

$\Rightarrow \sin 45°\left(1+\frac{\sin 45°}{\cos 45°}\right)+\cos 45°\left(1+\frac{\cos 45°}{\sin 45°}\right)$

$=\frac{1}{\sqrt{2}}\times 2+\frac{1}{\sqrt{2}}\times 2=\sqrt{2}+\sqrt{2}=2\sqrt{2}$

Go through options,

secA + cosecA = sec45° + cosec45°

$=\sqrt{2}+\sqrt{2}=2\sqrt{2}$

300. (d) $\tan\theta+\cot\theta=2$

$\Rightarrow \tan\theta+\frac{1}{\tan\theta}=2$

$\Rightarrow \tan^2\theta+1=2\tan\theta$

$\Rightarrow \sec^2\theta=2\tan\theta \Rightarrow 1=2\sin\theta\cos\theta$

$\Rightarrow \sin 2\theta=\sin 90°$

$\Rightarrow 2\theta=90°$

$\Rightarrow \theta=45°$

Alternate Method:

$\tan\theta+\cot\theta=2$

$\Rightarrow \tan\theta+\frac{1}{\tan\theta}=2$

$\Rightarrow \tan\theta=1=\tan 45°$

$\Rightarrow \theta=45°$

301. (b) tan A + cot A = 2

When we put A = 45° then,

1 + 1 = 2

$\therefore \tan^2 A+\cot^2 A$

$=\tan^2 45°+\cot^2 45°$

= 1 + 1 = 2

302. (b) tan A + cotA = 2

Put, A = 45°

tan45° + cot45° = 2 (Satisfied)

$\therefore 7\tan^3 45°-6\cot^3 45°+8\sec^2 45°$

$=7\times 1-6\times 1+8\times(\sqrt{2})^2$

= 7 – 6 + 16 = 17

303. (a) $\tan\theta+\cot\theta=2$

Let, θ = 45° satisfy the condition.

$\therefore \tan^2\theta+\cot^3\theta+6\tan^3\theta\cot^2\theta$

$=\tan^2 45°+\cot^3 45°+6\tan^3 45°\cot^2 45°=1+1+6=8$

304. (c) $\cot\theta+\tan\theta=2$

Let, θ = 45° satisfy the condition

$\therefore \tan^{12}\theta+\cot^{12}\theta+2\tan^5\theta\cot^7\theta$

$=\tan^{12}45°+\cot^{12}45°+2\tan^5 45°\cot^7 45°=1+1+2=4$

305. (b) $\tan\theta+\cot\theta=2$

Put θ = 45°

$\therefore \tan^{53}\theta+\cot^{38}\theta=1+1=2$

Alternate Method:

$\tan\theta+\cot\theta=2 \Rightarrow \tan\theta+\frac{1}{\tan\theta}=2$

We know,

$x+\frac{1}{x}=2$

$\Rightarrow x=1$

Hence, $\tan^{53}\theta+\cot^{38}\theta=1+1=2$

306. (a) If $\sin\theta+\operatorname{cosec}\theta=2$

Then, θ = 90°

$\therefore \sin^5\theta+\operatorname{cosec}^5\theta=2$

Alternate Method:

$\sin\theta+\operatorname{cosec}\theta=2$

$\Rightarrow \sin\theta+\frac{1}{\sin\theta}=2$

$\Rightarrow \frac{\sin^2\theta+1}{\sin\theta}=2$

$\Rightarrow \sin^2\theta-2\sin\theta+1=0$

$\Rightarrow (\sin\theta-1)^2=0 \Rightarrow \sin\theta=1$

$\Rightarrow \theta=90°$

$\therefore \sin^5\theta+\operatorname{cosec}^5\theta$

$=\sin^5 90°+\operatorname{cosec}^5 90°$

= 1 + 1 = 2

307. (c) Given, $\cos\theta+\sec\theta=2$

We know,

cos0° = 1 and sec0° = 1

put θ = 0°

$\sin^6\theta+\cos^6\theta=(\sin 0°)^6+(\cos 0°)^6$

= 0 + 1 = 1

308. (b) $\tan\theta+\cot\theta=6$

$\Rightarrow \tan^2\theta+\cot^2\theta=34$

$\because \left[x+\frac{1}{x}=n; x^2+\frac{1}{x^2}=n^2-2\right]$

309. (d) $\because \sin\theta+\operatorname{cosec}\theta=\sqrt{5}$

$\Rightarrow \sin\theta+\frac{1}{\sin\theta}=\sqrt{5}$

[If $x+\frac{1}{x}=k$,

Then $x^3+\frac{1}{x^3}=(k^3-3k)$]

$\therefore \sin^3\theta+\frac{1}{\sin^3\theta}=(\sqrt{5})^3-3\sqrt{5}$

$=5\sqrt{5}-3\sqrt{5}$

$\therefore \sin^3\theta+\operatorname{cosec}^3\theta=2\sqrt{5}$

310. (a) $\cos\theta+\sec\theta=\sqrt{3}$

$\cos\theta+\frac{1}{\cos\theta}=\sqrt{3}$

Cube both side

$\cos^3\theta+\frac{1}{\cos^3\theta}=(\sqrt{3})^3-3\sqrt{3}$

$=3\sqrt{3}-3\sqrt{3}=0$

311. (b) $\sec\theta+\cos\theta=32$

$\Rightarrow (\sec\theta+\cos\theta)^2=(32)^2$

$\Rightarrow \sec^2\theta+\cos^2\theta+2\sec\theta\cos\theta=1024$

$\Rightarrow \sec^2\theta+\cos^2\theta=1024-2$

= 1022

Alternate Method:

If $x+\frac{1}{x}=k$

Then, $x^2+\frac{1}{x^2}=k^2-2=32^2-2$

= 1024 – 2 = 1022

312. (c) $3x=\sec A$, $\frac{3}{x}=\tan A$

$\therefore \sec^2 A-\tan^2 A=1$

$\Rightarrow (3x)^2-\left(\frac{3}{x}\right)^2=1$

$\Rightarrow 9x^2-\frac{9}{x^2}=1$

$\Rightarrow 9\left(x^2-\frac{1}{x^2}\right)=1$

313. (b) $\sin\alpha-\operatorname{cosec}\theta=6$

Let, $\sin\alpha=x$

$x-\frac{1}{x}=6$

$x+\frac{1}{x}=\sqrt{\left(x-\frac{1}{x}\right)^2+4}=\sqrt{36+4}=\sqrt{40}$

$\sin\alpha+\operatorname{cosec}\theta=\sqrt{40}$

314. (c) $\sec x-\cos x=4$

$\Rightarrow \sec x+\cos x=\sqrt{(\sec x-\cos x)^2+4}$

$=\sqrt{20}=2\sqrt{5}$

$\left[\text{Using, if } x-\frac{1}{x}=a, x+\frac{1}{x}=\sqrt{a^2+4}\right]$

315. (c) $\sin x+\operatorname{cosec} x=2$

$\Rightarrow \sin x+\frac{1}{\sin x}=2$

$\Rightarrow \sin x=1$

$\Rightarrow x=90°$

$\therefore \sin^7 x+\operatorname{cosec}^7 x$

$=\sin^7 x+\frac{1}{\sin^7 x}=(1)^7+\frac{1}{(1)^7}=2$

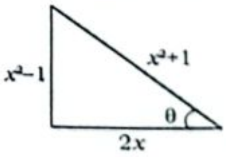
316. (c) $\sec\theta+\tan\theta=x$

$\sec\theta-\tan\theta=\frac{1}{x}$

$\underline{-\quad+\quad-}$

$2\tan\theta=x-\frac{1}{x}$

$\tan\theta=\frac{x^2-1}{2x}=\frac{P}{B}$



$\therefore H=\sqrt{P^2+B^2}=x^2+1$

$\therefore \sin\theta=\frac{P}{H}=\frac{x^2-1}{x^2+1}$

Note: x^2-1, $2x$, x^2+1 are triplet

Where $x=2$

317. (c) If tanA + secA = k

then, $\sec A-\tan A=\frac{1}{k}$

Now, $2\tan A=k-\frac{1}{k}$

$\tan A=\frac{k^2-1 \rightarrow P}{2k \rightarrow B}$

$H=k^2+1$

$\Rightarrow \sin A=\frac{k^2-1}{k^2+1}$

318. (c) $\sec A - \tan A = p$ ......(i)

$\Rightarrow \sec A + \tan A = \frac{1}{p}$ ......(ii)

Adding equation (i) and (ii)

$\Rightarrow 2\sec A = p + \frac{1}{p}$

$\Rightarrow \sec A = \frac{p^2+1}{2p}$

319. (b) A.T.Q,

$\sec\theta + \tan\theta = a$ ......(i)

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{a}$ ......(ii)

equ.[(i) + (ii)]

$2\sec\theta = a + \frac{1}{a} \Rightarrow \sec\theta = \frac{a^2+1}{2a}$

320. (c) $\sec\theta + \tan\theta = 5$

Then, $\sec\theta - \tan\theta = \frac{1}{5}$

Now, $\sec\theta = \frac{1}{2}\left(5+\frac{1}{5}\right)$

321. (b) $\sec\theta + \tan\theta = 5$

$\sec\theta - \tan\theta = \frac{1}{5}$

Now, $\sec\theta = \frac{1}{2}\left(5+\frac{1}{5}\right) = \frac{1}{2}\left(\frac{26}{5}\right)$

$= \frac{13 \rightarrow \text{Hypotenuse}}{5 \rightarrow \text{Base}}$

By triplet = $(\underset{B}{\underset{\downarrow}{5}}, \underset{P}{\underset{\downarrow}{12}}, \underset{H}{\underset{\downarrow}{13}})$

$\sin\theta = \frac{12}{13}$

322. (a) Given, $\sec\theta + \tan\theta = 5$

We know, $\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow 5 \times (\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{5}$

323. (b) Given,

$\sec\theta - \tan\theta = m$ ....(i)

We know,

$\sec^2\theta - \tan^2\theta = 1$

So, $\sec\theta + \tan\theta = \frac{1}{m}$ ....(ii)

Subtract Eqⁿ (i) from Eqⁿ (ii)

$\Rightarrow 2\tan\theta = \frac{1}{m} - m = \frac{1-m^2}{m}$

324. (d) Given,

$\sec\theta + \tan\theta = \sqrt{3}$ ......(i)

$\sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$ .....(ii)

Adding Eqⁿ (i) + (ii)

$\Rightarrow 2\sec\theta = \sqrt{3} + \frac{1}{\sqrt{3}}$

$\Rightarrow \sec\theta = \frac{2}{\sqrt{3}} = \sec 30°$

$\Rightarrow \theta = 30°$

$\therefore \sin\theta + \cos\theta = \frac{1}{2} + \frac{\sqrt{3}}{2} = \left(\frac{\sqrt{3}+1}{2}\right)$

325. (d) Given,

$\text{Sec}^2\theta + \tan^2\theta = \frac{25}{18}$

We know, $\left(\sec^2\theta - \tan^2\theta = 1\right)$

$\therefore \sec^4\theta - \tan^4\theta$

$= \left(\text{Sec}^2\theta + \tan^2\theta\right)\left(\sec^2\theta - \tan^2\theta\right)$

$= \frac{25}{18} \times 1 = \frac{25}{18}$

326. (a) $\text{cosec}\theta + \cot\theta = \frac{3}{2}$ ......(i)

$\text{cosec}\theta - \cot\theta = \frac{2}{3}$ ......(ii)

On adding (i) and (ii), We get–

$2\text{cosec}\theta = \frac{2}{3} + \frac{3}{2} = \frac{4+9}{6} = \frac{13}{6}$

$\Rightarrow \text{cosec}\theta = \frac{13}{12}$

327. (a) We know that–

$\text{cosec}^2A - \cot^2A = 1$

$\Rightarrow (\text{cosec}A + \cot A)(\text{cosec}A - \cot A) = 1$

$\Rightarrow \text{cosec}A - \cot A = \frac{1}{\text{cosec}\,A + \cot A}$

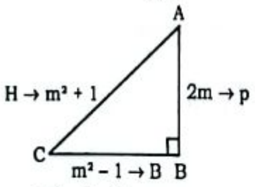
$\Rightarrow \text{cosec}A - \cot A = \frac{1}{m}$

328. (c) $\text{cosec}\theta + \cot\theta = m$ ...(i)

$\text{cosec}\theta - \cot\theta = \frac{1}{m}$ ....(ii)

On adding, $2\text{cosec}\theta = m + \frac{1}{m}$

$\Rightarrow \text{cosec}\theta = \frac{m^2+1}{2m}$



$\therefore \frac{m^2-1}{m^2+1} = \frac{B}{H} = \cos\theta$

Alternate Method:

Put $\theta = 45°$

$m = \text{cosec}\theta + \cot\theta = \sqrt{2}+1$

$\because \frac{m^2-1}{m^2+1} = \frac{(\sqrt{2}+1)^2-1}{(\sqrt{2}+1)^2+1} = \frac{3+2\sqrt{2}-1}{3+2\sqrt{2}+1}$

$= \frac{2+2\sqrt{2}}{4+2\sqrt{2}} = \frac{2(\sqrt{2}+1)}{2\sqrt{2}(\sqrt{2}+1)} = \frac{1}{\sqrt{2}}$

Go through options,

$\cos\theta = \cos 45° = \frac{1}{\sqrt{2}}$

329. (a) Given, $\text{cosec}A + \cot A = a\sqrt{b}$

$\Rightarrow \text{cosec}A = \frac{1}{2}\left(a\sqrt{b} + \frac{1}{a\sqrt{b}}\right) = \frac{a^2b+1}{2a\sqrt{b}}$

$\cot A = \frac{1}{2}\left(a\sqrt{b} - \frac{1}{a\sqrt{b}}\right) = \frac{a^2b-1}{2a\sqrt{b}}$

$\therefore \frac{\cot A}{\text{cosec}A} = \frac{\frac{a^2b-1}{2a\sqrt{b}}}{\frac{a^2b+1}{2a\sqrt{b}}}$

$\Rightarrow \cos A = \frac{a^2b-1}{a^2b+1}$

Alternate Method:

Put A = 45°

$\text{cosec}45° + \cot 45° = a\sqrt{b}$

$\Rightarrow \sqrt{2}+1 = a\sqrt{b}$

$\Rightarrow a^2b = 3 + 2\sqrt{2}$

$\therefore \frac{a^2b-1}{a^2b+1} = \frac{3+2\sqrt{2}-1}{3+2\sqrt{2}+1} = \frac{2+2\sqrt{2}}{4+2\sqrt{2}}$

$= \frac{2(\sqrt{2}+1)}{2\sqrt{2}(\sqrt{2}+1)} = \frac{1}{\sqrt{2}}$

Go through options,

$\cos A = \cos 45° = \frac{1}{\sqrt{2}}$

330. (b) $\sec x + \tan x = 5$

$\Rightarrow \sec x - \tan x = \frac{1}{5}$

$\text{cosec}y - \cot y = \frac{1}{3}$

$\Rightarrow \text{cosec}y + \cot y = 3$

ATQ,

$(\sec x + \text{cosec}\,y) - (\tan x - \cot y)$

$= (\sec x + \text{cosec}y - \tan x + \cot y)$

$= (\sec x - \tan x + \text{cosec}y + \cot y)$

$= \left(\frac{1}{5}+\frac{3}{1}\right) = \frac{16}{5} = 3.2$

331. (b) $2\sin^2\theta + 3\sin\theta - 2 = 0$

$\Rightarrow 2\sin^2\theta + 4\sin\theta - \sin\theta - 2 = 0$

$\Rightarrow 2\sin\theta(\sin\theta + 2) - 1(\sin\theta + 2) = 0$

$\Rightarrow (2\sin\theta - 1)(\sin\theta + 2) = 0$

$\sin\theta = -2$ **(not possible)**

so, $\sin\theta = \frac{1}{2}$

Then, $\theta = 30°$

Alternate Method:-

By option (b)

$2\sin^2 30° + 3\sin 30° - 2 = 0$

$\Rightarrow 2 \times \frac{1}{4} + 3 \times \frac{1}{2} - 2 = 0$

$\Rightarrow \left(\frac{1}{2}+\frac{3}{2}\right) - 2 = 0$

$\Rightarrow 2 - 2 = 0$

$\theta = 30°$ satisfy the above condition.

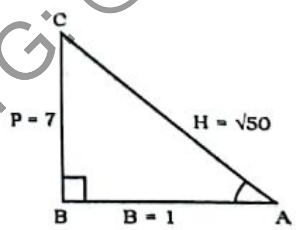
332. (c) $\tan^2A + 2\tan A - 63 = 0$

$\Rightarrow \tan^2A + 9\tan A - 7\tan A - 63 = 0$

$\Rightarrow \tan A(\tan A + 9) - 7(\tan A + 9) = 0$

$\Rightarrow (\tan A - 7)(\tan A + 9) = 0$

$\Rightarrow \tan A = \frac{7}{1} = \frac{P}{B}$



$\Rightarrow H = \sqrt{50}$

$\therefore 2\sin A + 5\cos A$

$= \left(2 \times \frac{7}{\sqrt{50}}\right) + \left(5 \times \frac{1}{\sqrt{50}}\right) = \frac{19}{\sqrt{50}}$

333. (c) $10\sin^2\theta + 6\cos^2\theta = 7$

$\Rightarrow 4\sin^2\theta + 6(\sin^2\theta + \cos^2\theta) = 7$

$\Rightarrow 4\sin^2\theta + 6 = 7 \Rightarrow 4\sin^2\theta = 1$

$\Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$

$\therefore \tan\theta = \tan 30° = \frac{1}{\sqrt{3}}$

334. (a) $12\sin^2 A + 2\cos^2 A = 7$

$\Rightarrow 10\sin^2 A + 2\sin^2 A + 2\cos^2 A = 7$

$\Rightarrow 10\sin^2 A + 2 = 7 \Rightarrow 10\sin^2 A = 5$

$\Rightarrow \sin^2 A = \frac{1}{2} \Rightarrow \sin A = \frac{1}{\sqrt{2}}$

$\Rightarrow A = 45°, 135°$

$\therefore \cot A = \pm 1$

335. (c) $4\sin^2\theta - 4\sqrt{3}\sin\theta + 3 = 0$

$\Rightarrow 4\sin^2\theta - 2\sqrt{3}\sin\theta - 2\sqrt{3}\sin\theta + 3 = 0$

$\Rightarrow 2\sin\theta(2\sin\theta - \sqrt{3}) - \sqrt{3}(2\sin\theta - \sqrt{3}) = 0$

$\Rightarrow (2\sin\theta - \sqrt{3})^2 = 0$

$\Rightarrow 2\sin\theta = \sqrt{3}$

$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 60°$

Alternate Method:

Put $\theta = 60°$

Only option (c) Satisfied.

336. (c) $2\cos^2 A + 3\cos A - 2 = 0$

$\Rightarrow 2\cos^2 A + 4\cos A - \cos A - 2 = 0$

$\Rightarrow 2\cos A(\cos A + 2) - 1(\cos A + 2)$

$\Rightarrow (\cos A + 2)(2\cos A - 1)$

$\Rightarrow \cos A + 2 = 0,\ 2\cos A - 1 = 0$

$\cos A = -2$ (not possible)

So, we take $\cos A = \frac{1}{2} = \cos 60°$

$\Rightarrow A = 60°$

337. (a) $4\sin^2\theta = 3(1 + \cos\theta)$

$\Rightarrow 4(1 - \cos^2\theta) = 3 + 3\cos\theta$

$\Rightarrow 4 - 4\cos^2\theta = 3 + 3\cos\theta$

$\Rightarrow 4\cos^2\theta + 3\cos\theta - 1 = 0$

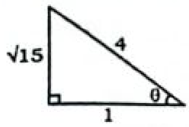
$\Rightarrow 4\cos^2\theta + 4\cos\theta - \cos\theta - 1 = 0$

$\Rightarrow 4\cos\theta(\cos\theta + 1) - 1(\cos\theta + 1) = 0$

$\Rightarrow (4\cos\theta - 1)(\cos\theta + 1) = 0$

$\Rightarrow \cos\theta = \frac{1}{4}; -1$

we can't take − 1 because cos between 0 to 90° is not–ve.



$\therefore \sqrt{15}\tan\theta + \frac{4}{\sqrt{15}}\sin\theta + 2\sec\theta$

$= \sqrt{15} \times \sqrt{15} + \frac{4}{\sqrt{15}} \times \frac{\sqrt{15}}{4} + 2\times 4 = 24$

Alternate Method:

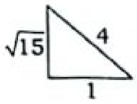
$4\sin^2\theta = 3(1 + \cos\theta)$

$4(1 - \cos^2\theta) = 3(1 + \cos\theta)$

$4(1 - \cos\theta)(1 + \cos\theta) = 3(1 + \cos\theta)$

$1 - \cos\theta = \frac{3}{4}$

$\cos\theta = \frac{1}{4}$



$\sqrt{15}\tan\theta + \frac{4}{\sqrt{15}}\sin\theta + 2\sec\theta$

$\sqrt{15} \times \sqrt{15} + \frac{4}{\sqrt{15}} \times \frac{\sqrt{15}}{4} + 2 \times \frac{4}{1}$

$= 24$

338. (a) $3\sec^4\theta + 8 = 10\sec^2\theta$

$\Rightarrow 3\sec^4\theta - 10\sec^2\theta + 8 = 0$

$\Rightarrow 3\sec^4\theta - 6\sec^2\theta - 4\sec^2\theta + 8 = 0$

$\Rightarrow 3\sec^2\theta(\sec^2\theta - 2) - 4(\sec^2\theta - 2) = 0$

$\Rightarrow (3\sec^2\theta - 4)(\sec^2\theta - 2) = 0$

$\Rightarrow 3\sec^2\theta - 4 = 0$

$\Rightarrow \sec\theta = \frac{2}{\sqrt{3}} \Rightarrow \theta = 30°$

and $\sec^2\theta - 2 = 0$

$\Rightarrow \sec^2\theta = 2 \Rightarrow \sec\theta = \sqrt{2} \Rightarrow \theta = 45°$

$\therefore \tan 30° = \frac{1}{\sqrt{3}};\ \tan 45° = 1$

339. (c) $7\sin^2 A + 3\cos^2 A = 4$

$\Rightarrow 4\sin^2 A + 3(\sin^2 A + \cos^2 A) = 4$

$\Rightarrow 4\sin^2 A = 1$

$\Rightarrow \sin A = \frac{1}{2} \Rightarrow A = 30°$

$\therefore \cot A = \cot 30° = \sqrt{3}$

340. (c) Given,

$2\operatorname{cosec}^2\theta + 3\cot^2\theta = 17$

$\Rightarrow 2\operatorname{cosec}^2\theta + 3\operatorname{cosec}^2\theta - 3 = 17$

$\Rightarrow 5\operatorname{cosec}^2\theta = 20$

$\Rightarrow \operatorname{cosec}\theta = \sqrt{4} = 2 = \operatorname{cosec}30°$

$\Rightarrow \theta = 30°$

Note: $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

341. (d) $\sec^2\alpha + 4\cos^2\alpha = 4$

Put, $\theta = 45°$

$\Rightarrow \sec^2 45° + 4\cos^2 45° = 4$

$\Rightarrow (\sqrt{2})^2 + 4\left(\frac{1}{\sqrt{2}}\right)^2 = 4$

$\Rightarrow 2 + 4 \times \frac{1}{2} = 4$

$\Rightarrow 4 = 4$ [satisfy]

342. (a) $7\cos^2\theta + 5\sin^2\theta - 6 = 0$

$\Rightarrow 5(\sin^2\theta + \cos^2\theta) + 2\cos^2\theta - 6 = 0$

$\Rightarrow \cos\theta = \frac{1}{\sqrt{2}}$

$\Rightarrow \theta = 45°$

$\therefore 1 + \sqrt{\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}} = 1 + \sqrt{\frac{(\sec\theta + \tan\theta)^2}{\sec^2\theta - \tan^2\theta}}$

$= 1 + \sec\theta + \tan\theta = 1 + \sec 45° + \tan 45°$

$= 1 + \sqrt{2} + 1 = 2 + \sqrt{2}$

Alternate Method:

Let, $\theta = 45°$

$7\cos^2\theta + 5\sin^2\theta - 6 = 0$

$\Rightarrow 7 \times \frac{1}{2} + 5 \times \frac{1}{2} - 6 = 0$

$\Rightarrow 0 = 0$ (verified)

$\therefore 1 + \sqrt{\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}} = 1 + \sqrt{\frac{(\sec\theta + \tan\theta)^2}{\sec^2\theta - \tan^2\theta}}$

$= 1 + \sec\theta + \tan\theta = 1 + \sec 45° + \tan 45°$

$= 1 + \sqrt{2} + 1 = 2 + \sqrt{2}$

343. (d) $\sqrt{2}\sec^2\theta - 4\sec\theta + 2\sqrt{2} = 0$

$\Rightarrow \sqrt{2}\sec^2\theta - 2\sec\theta - 2\sec\theta + 2\sqrt{2} = 0$

$\Rightarrow \sqrt{2}\sec\theta(\sec\theta - \sqrt{2}) - 2(\sec\theta - \sqrt{2}) = 0$

$\Rightarrow \sec\theta = \sqrt{2} \Rightarrow \theta = 45°$

$\therefore \sin^2\theta + \tan^2\theta = \sin^2 45° + \tan^2 45°$

$= \frac{1}{2} + 1 = \frac{3}{2}$

Alternate Method:

$\sqrt{2}\sec^2\theta - 4\sec\theta + 2\sqrt{2} = 0$

Put $\theta = 45°$

$\Rightarrow \sqrt{2} \times (\sqrt{2})^2 - 4 \times \sqrt{2} + 2\sqrt{2} = 0$

$\Rightarrow 2\sqrt{2} - 4\sqrt{2} + 2\sqrt{2} = 0$

$\Rightarrow 4\sqrt{2} - 4\sqrt{2} = 0$ (Satisfied)

$\therefore \sin^2\theta + \tan^2\theta = \sin^2 45° + \tan^2 45°$

$= \frac{1}{2} + 1 = \frac{3}{2}$

344. (c) $\sin^2\theta - \cos^2\theta - 3\sin\theta + 2 = 0$

$\Rightarrow \sin^2\theta - (1 - \sin^2\theta) - 3\sin\theta + 2 = 0$

$\Rightarrow \sin^2\theta - 1 + \sin^2\theta - 3\sin\theta + 2 = 0$

$\Rightarrow 2\sin^2\theta - 3\sin\theta + 1 = 0$

$\Rightarrow 2\sin^2\theta - 2\sin\theta - \sin\theta + 1 = 0$

$\Rightarrow 2\sin\theta(\sin\theta - 1) - 1(\sin\theta - 1) = 0$

$\Rightarrow (2\sin\theta - 1)(\sin\theta - 1) = 0$

$\Rightarrow \sin\theta - 1 = 0 \Rightarrow \sin\theta = 1$

$\Rightarrow \theta = 90°$ [Not possible because $0° < \theta < 90°$]

$\Rightarrow 2\sin\theta - 1 = 0 \Rightarrow \sin\theta = \frac{1}{2}$

$\Rightarrow \theta = 30°$

$\therefore 1 + \sec\theta + \tan\theta = 1 + \sec 30° + \tan 30°$

$= 1 + \left(\frac{2}{\sqrt{3}}\right) + \left(\frac{1}{\sqrt{3}}\right) = \frac{(\sqrt{3} + 3)}{\sqrt{3}}$

$= 1 + \sqrt{3}$

345. (a) $6\cos^2\theta + \cos\theta - 2 = 0$

$\Rightarrow 6\cos^2\theta + 4\cos\theta - 3\cos\theta - 2 = 0$

$\Rightarrow 2\cos\theta(3\cos\theta + 2) - 1(3\cos\theta + 2) = 0$

$$\begin{array}{l|l} 2\cos\theta = 1 & 3\cos\theta = -2 \\ \cos\theta = \frac{1}{2} & \cos\theta = \frac{-2}{3} \end{array}$$

$\theta = 60°$ $(\because 0° < \theta < 90°)$

$\therefore (\operatorname{cosec}\theta + \cot\theta + \tan\theta)$

$= \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} + \sqrt{3}$

$= \frac{6}{\sqrt{3}} = 2\sqrt{3}$

346. (c) $8\cos^2\theta - 2\cos\theta - 3 = 0$

$\Rightarrow 8\cos^2\theta - 6\cos\theta + 4\cos\theta - 3 = 0$

$\Rightarrow 2\cos\theta(4\cos\theta - 3) + 1(4\cos\theta - 3) = 0$

$\Rightarrow (4\cos\theta - 3)(2\cos\theta + 1) = 0$

$\Rightarrow \cos\theta = \frac{3}{4}, -\frac{1}{2}$

$\Rightarrow \cos\theta = \frac{3 \rightarrow B}{4 \rightarrow H}$

$P = \sqrt{4^2 - 3^2} = \sqrt{7}$

$\therefore 3\tan\theta + \operatorname{cosec}\theta + \cot\theta$

$= 3 \times \frac{\sqrt{7}}{3} + \frac{4}{\sqrt{7}} + \frac{3}{\sqrt{7}} = \frac{14}{\sqrt{7}} = 2\sqrt{7}$

347. (a) $7\sin^2\theta + 4\cos^2\theta = 5$

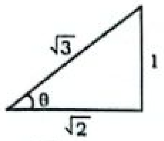
$\Rightarrow 3\sin^2\theta + 4\sin^2\theta + 4\cos^2\theta = 5$

$\Rightarrow 3\sin^2\theta + 4(\sin^2\theta + \cos^2\theta) = 5$

$\Rightarrow 3\sin^2\theta + 4 = 5 \Rightarrow 3\sin^2\theta = 1$

$$\Rightarrow \sin\theta = \frac{1 \to P}{\sqrt{3} \to H}$$

$$B = \sqrt{(\sqrt{3})^2 - 1^2} = \sqrt{2}$$



$$\therefore \frac{\sqrt{3}\sec\theta + \tan\theta}{\sqrt{2}\cot\theta - \sqrt{3}\cos\theta}$$

$$= \frac{\sqrt{3} \times \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}}}{\sqrt{2} \times \frac{\sqrt{2}}{1} - \sqrt{3} \times \frac{\sqrt{2}}{\sqrt{3}}} = \frac{\frac{4}{\sqrt{2}}}{\frac{2-\sqrt{2}}{1}}$$

$$= \frac{4}{\sqrt{2} \times \sqrt{2}(\sqrt{2}-1)}$$

$$= \frac{2(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)} = 2(\sqrt{2}+1)$$

348. (a) $\sin^2\theta - \cos^2\theta - 3\sin\theta + 2 = 0$

$\Rightarrow \sin^2\theta - 1 + \sin^2\theta - 3\sin\theta + 2 = 0$

$\Rightarrow 2\sin^2\theta - 3\sin\theta + 1 = 0$

$\Rightarrow \sin\theta = 1, \frac{1}{2}$

$0° < \theta < 90°$

$\sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$

$$\therefore \frac{1}{\sqrt{\sec\theta - \tan\theta}} = \frac{1}{\sqrt{\frac{2}{\sqrt{3}} - \frac{1}{\sqrt{3}}}} = \sqrt[4]{3}$$

349. (d) $\sec^2\theta + (1-\sqrt{3})\tan\theta - (1+\sqrt{3}) = 0$

$\Rightarrow 1 + \tan^2\theta + (1-\sqrt{3})\tan\theta = 1 + \sqrt{3}$

$\Rightarrow \tan^2\theta + (1-\sqrt{3})\tan\theta - \sqrt{3} = 0$

$\Rightarrow \tan\theta = -1, \sqrt{3}$

Since θ is acute

$\Rightarrow \tan\theta = \sqrt{3} = \tan 60°$

$\Rightarrow \theta = 60°$

Alternate Method:

$\sec^2\theta + (1-\sqrt{3})\tan\theta - (1+\sqrt{3}) = 0$

by options

Put θ = 60°

$4 + (1-\sqrt{3})\sqrt{3} - (1+\sqrt{3})$

$= 4 + \sqrt{3} - 3 - 1 - \sqrt{3} = 0$

350. (c) $4 - 2\sin^2\theta - 5\cos\theta = 0$

$\Rightarrow 4 - 2(1 - \cos^2\theta) - 5\cos\theta = 0$

$\Rightarrow 4 - 2 + 2\cos^2\theta - 5\cos\theta = 0$

$\Rightarrow 2\cos^2\theta - 5\cos\theta + 2 = 0$

$\Rightarrow 2\cos^2\theta - 4\cos\theta - \cos\theta + 2 = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta - 2) = 0$

$\Rightarrow 2\cos\theta - 1 = 0$

$\cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

$\therefore \cos\theta + \tan\theta = \cos 60° + \tan 60°$

$= \frac{1}{2} + \sqrt{3} = \frac{1+2\sqrt{3}}{2}$

Alternate Method:-

$4 - 2\sin^2\theta - 5\cos\theta = 0$

Put $\theta = 60°,\ 4 - 2 \times \frac{3}{4} - 5 \times \frac{1}{2}$

$= 4 - \frac{3}{2} - \frac{5}{2} = 4 - 4 = 0$

Go through options,

$\therefore \cos\theta + \tan\theta = \cos 60° + \tan 60°$

$= \frac{1}{2} + \sqrt{3} = \frac{1+2\sqrt{3}}{2}$

351. (d) $\frac{\sin^2\theta - 3\sin\theta + 2}{\cos^2\theta} = 1$

$\Rightarrow \text{Sin}^2\theta - 2\text{Sin}\theta - \text{Sin}\theta + 2 = \text{Cos}^2\theta$

$\Rightarrow (\text{Sin}\theta - 1)(\text{Sin}\theta - 2) = (1 - \text{Sin}\theta)(1 + \text{Sin}\theta)$

$\Rightarrow -\text{Sin}\theta + 2 = 1 + \text{Sin}\theta$

$\Rightarrow 2\text{Sin}\theta = 1$

$\Rightarrow \text{Sin}\theta = \frac{1}{2}$

$\Rightarrow \theta = 30°$

$\therefore \text{Cos}2\theta - \text{Sin}3\theta + \text{Cosec}2\theta$

$= \frac{1}{2} - 1 + \frac{2}{\sqrt{3}}$

$= \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} - \frac{1}{2} = \frac{2\sqrt{3}}{3} - \frac{1}{2} = \frac{4\sqrt{3}-3}{6}$

352. (d) $\frac{\sin^2\theta}{\cos^2\theta - 3\cos\theta + 2} = 1$

$\Rightarrow 1 - \cos^2\theta = \cos^2\theta - 3\cos\theta + 2$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$\Rightarrow \cos\theta = 1$ and $\frac{1}{2}$ (since θ lies in 1st quadrant)

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

$$\therefore \frac{\tan^2\frac{\theta}{2} + \sin^2\frac{\theta}{2}}{\tan\theta + \sin\theta} = \frac{\tan^2 30° + \sin^2 30°}{\tan 60° + \sin 60°}$$

$$= \frac{\left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{1}{2}\right)^2}{\sqrt{3} + \frac{\sqrt{3}}{2}}$$

$$= \frac{\frac{1}{3} + \frac{1}{4}}{\frac{3\sqrt{3}}{2}} = \frac{\frac{7}{12}}{\frac{3\sqrt{3}}{2}} = \frac{7}{18\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{7\sqrt{3}}{54}$$

353. (b) $\sin\theta\cos\theta = 2\cos^3\theta - \frac{1}{4}\cos\theta$

$\Rightarrow \sin\theta = 2\cos^2\theta - \frac{1}{4}$

$\Rightarrow \sin\theta = 2(1 - \sin^2\theta) - \frac{1}{4}$

$\Rightarrow 4\sin\theta = 8(1 - \sin^2\theta) - 1$

$\Rightarrow 8\sin^2\theta + 4\sin\theta - 7 = 0$

$$\sin\theta = \frac{-4 \pm \sqrt{4^2 - 4 \times 8 \times (-7)}}{2 \times 8}$$

$$= \frac{-4 \pm \sqrt{16 + 224}}{16}$$

$$= \frac{-4 \pm \sqrt{240}}{16} = \frac{-4 \pm \sqrt{15 \times 16}}{16}$$

$$= \frac{+\sqrt{15}+1}{4}, \frac{\sqrt{15}-1}{4}$$

∵ Angle is acute

So, $\sin\theta = \frac{\sqrt{15}-1}{4}$

354. (d) $[(\sin\theta\tan\theta + \cos\theta)^2 - 1]$

$= [\sin^2\theta\tan^2\theta + \cos^2\theta + 2\sin\theta.\tan\theta\cos\theta - 1]$

$= [\sin^2\theta\tan^2\theta + 2\sin\theta\tan\theta\cos\theta - \sin^2\theta]$

$= [\sin^2\theta\tan^2\theta + 2\sin^2\theta - \sin^2\theta]$

$= \sin^2\theta[\tan^2\theta + 1] = \sin^2\theta.\sec^2\theta$

$= \frac{\sin^2\theta}{\cos^2\theta} = \tan^2\theta$

Alternate Method:

put θ = 60°

$[(\sin\theta.\tan\theta + \cos\theta)^2 - 1]$

$$= \left[\left(\frac{\sqrt{3}}{2} \times \sqrt{3} + \frac{1}{2}\right)^2 - 1\right]$$

$= [(2)^2 - 1] = 3$

from option (d)

$\tan^2\theta = \tan^2 60° = 3$ (verified)

355. (c) $(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$

$$= \left(\frac{1}{\sin\theta} - \sin\theta\right)\left(\frac{1}{\cos\theta} - \cos\theta\right)\left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right)$$

$$= \left(\frac{1-\sin^2\theta}{\sin\theta}\right)\left(\frac{1-\cos^2\theta}{\cos\theta}\right)\left(\frac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta}\right)$$

$$= \left(\frac{\cos^2\theta}{\sin\theta}\right)\left(\frac{\sin^2\theta}{\cos\theta}\right)\left(\frac{1}{\sin\theta\cos\theta}\right) = 1$$

Alternate Method:-

Put θ = 45°

$(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$

$= (\text{cosec}45° - \sin45°)(\sec45° - \cos45°)(\tan45° + \cot45°)$

$$= \left(\sqrt{2} - \frac{1}{\sqrt{2}}\right)\left(\sqrt{2} - \frac{1}{\sqrt{2}}\right)(1+1)$$

$$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times 2 = 1$$

356. (b) $(\tan\theta + \cot\theta)(\sec\theta + \tan\theta)(1 - \sin\theta)$

$$= \left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right)\left(\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)(1 - \sin\theta)$$

$$= \frac{1}{\sin\theta\cos\theta} \times \frac{(1+\sin\theta)(1-\sin\theta)}{\cos\theta}$$

$$= \frac{\cos^2\theta}{\sin\theta\cos^2\theta} = \frac{1}{\sin\theta} = \text{cosec}\theta$$

Alternate Method:-

Put θ = 60°

$(\tan60° + \cot60°)(\sec60° + \tan60°)(1 - \sin60°)$

$$= \left(\sqrt{3} + \frac{1}{\sqrt{3}}\right)(2+\sqrt{3})\left(1 - \frac{\sqrt{3}}{2}\right)$$

$$= \frac{4}{\sqrt{3}} \times (2+\sqrt{3}) \times \frac{(2-\sqrt{3})}{2}$$

$$= \frac{4}{\sqrt{3}} \times \frac{1}{2} = \frac{2}{\sqrt{3}}$$

Go through options,

$\text{cosec}60° = \frac{2}{\sqrt{3}}$

357. (d) $(\sin^6A + \cos^6A + 3\sin^2A\cos^2A) - (\sin^4A - \cos^4A + 1)\times \text{cosec}^2A$

We know that,

$(\sin^6A + \cos^6A = 1 - 3\sin^2A\cos^2A)$

$\Rightarrow (1 - 3\sin^2A\cos^2A + 3\sin^2A\cos^2A) - (\sin^2A - \cos^2A + 1) \times \text{cosec}^2A$

$= 1 - 2\sin^2A\,\text{cosec}^2A = -1$

Alternate Method:-

Put A = 90° $\Rightarrow 1 - (1 + 1) = -1$

358. (d) $4(\sin^6A + \cos^6A) - 6(\sin^4A + \cos^4A) + 8$

$= 4(1 - 3\sin^2A\cos^2A) - 6(1 - 2\sin^2A\cos^2A) + 8$

$= 4 - 12\sin^2A\cos^2A - 6 + 12\sin^2A\cos^2A + 8 = 6$

Alternate Method:

Put A = 0°

$\Rightarrow 4(\sin^60° + \cos^60°) - (\sin^40° + \cos^40°) + 8$

$= 4(0 + 1) - 6(0 + 1) + 8$

$= 4 - 6 + 8 = 6$

359. (a) $12(\sin^4\theta + \cos^4\theta) + 18(\sin^6\theta + \cos^6\theta) + 78\sin^2\theta\cos^2\theta$

$[\because \sin^4 + \cos^4\theta = 1 - 2\sin^2\theta.\cos^2\theta$

$\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta.\cos^2\theta]$

So, $12(1 - 2\sin^2\theta.\cos^2\theta) + 18(1 - 3\sin^2\theta.\cos^2\theta) + 78\sin^2\theta.\cos^2\theta$

$= 12 - 24\sin^2\theta.\cos^2\theta + 18 - 54\sin^2\theta.\cos^2\theta + 78\sin^2\theta.\cos^2\theta$

$= 30 - 78\sin^2\theta.\cos^2\theta + 78\sin^2\theta.\cos^2\theta = 30$

Alternate Method:

Put θ = 0°

$\Rightarrow 12(\sin^40° + \cos^40°) + 18(\sin^60° + \cos^60°) + 78\sin^20°\cos^20°$

$= 12 + 18 = 30$

360. (a) $5(\sin^4\theta + \cos^4\theta) + 3(\sin^6\theta + \cos^6\theta) + 19\sin^2\theta\cos^2\theta$

$= 5[(1)^2 - 2\sin^2\theta\cos^2\theta] + 3[1 - 3\sin^2\theta\cos^2\theta] + 19\sin^2\theta\cos^2\theta$

$= 5 - 10\sin^2\theta\cos^2\theta + 3 - 9\sin^2\theta\cos^2\theta + 19\cos^2\theta\sin^2\theta = 8$

Alternate Method:

Put θ = 90°

$\Rightarrow 5(\sin^490° + \cos^490°) + 3(\sin^690° + \cos^690°) + 19\sin^290°\cos^290°$

$= 5 + 3 = 8$

361. (a) $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3$

$= (1 - 3\sin^2\theta\cos^2\theta - 1)(1 + \tan^2\theta + 1 + \cot^2\theta) + 3$

$= (-3\sin^2\theta\cos^2\theta)\times(\sec^2\theta + \text{cosec}^2\theta) + 3$

$= -3\sin^2\theta\cos^2\theta \times \dfrac{1}{\sin^2\theta\cos^2\theta} + 3$

$= -3 + 3 = 0$

Alternate Method:

Put θ = 45°,

$(\cos^645° + \sin^645° - 1)(\tan^245° + \cot^245° + 2) + 3$

$= \left[\left(\dfrac{1}{\sqrt{2}}\right)^6 + \left(\dfrac{1}{\sqrt{2}}\right)^6 - 1\right](1^2 + 1^2 + 2) + 3$

$= \left[\dfrac{1}{8} + \dfrac{1}{8} - 1\right](1 + 1 + 2) + 3$

$= \left[\dfrac{1+1-8}{8}\right] \times 4 + 3$

$= -\dfrac{3}{4} \times 4 + 3 = -3 + 3 = 0$

362. (a) $p\sin A - \cos A = 1$

Put A = 90°

$\Rightarrow p\sin 90° - \cos 90° = 1$

$\Rightarrow p \times 1 - 0 = 1$

$\Rightarrow p = 1$

Now,

$p^2 - (1 + p^2)\cos A$

$= 1 - (1 + 1^2)\cos 90° = 1$

$- 2 \times 0 = 1 - 0 = 1$

363. (a) $\sin A + \cos A = \dfrac{1}{2\sqrt{2}}$

Squaring both sides,

$\sin^2A + \cos^2A + 2\sin A\cos A = \dfrac{1}{8}$

$\Rightarrow 2\sin A\cos A = \dfrac{1}{8} - 1 = \dfrac{-7}{8}$

$\Rightarrow 4\sin^2A\cos^2A = \dfrac{49}{64}$

$\therefore \sin^4A + \cos^4A = (\sin^2A + \cos^2A)^2 - 2\sin^2A\cos^2A$

$= 1 - 2\sin^2A\cos^2A$

$= 1 - \dfrac{49}{128} = \dfrac{79}{128}$

364. (d) $\sin A + \cos A = \sqrt{3}$

Squaring both side:-

$\Rightarrow 1 + 2\sin A\cos A = 3$

$\Rightarrow \sin A\cos A = 1$ ....(i)

$\therefore \tan A + \cot A + 2\sin A\cos A$

$= \dfrac{\sin A}{\cos A} + \dfrac{\cos A}{\sin A} + 2\sin A\cos A$

$= \dfrac{\sin^2A + \cos^2A}{\sin A\cos A} + 2\sin A\cos A$

$= \dfrac{1}{\sin A\cos A} + 2\sin A\cos A$

From equation (i) = 1 + 2 = 3

365. (c) $\sin A + \cos A = \dfrac{4}{3}$

Squaring both sides,

$\Rightarrow \sin^2A + \cos^2A + 2\sin A\cos A = \dfrac{16}{9}$

$\Rightarrow 1 + 2\sin A.\cos A = \dfrac{16}{9}$

$(\because \sin^2A + \cos^2A = 1)$

$\Rightarrow \sin A.\cos A = \dfrac{7}{18}$

$\therefore \tan A + \cot A = \dfrac{\sin A}{\cos A} + \dfrac{\cos A}{\sin A}$

$= \dfrac{\sin^2A + \cos^2A}{\cos A.\sin A} = \dfrac{1}{\sin A.\cos A}$

$= \dfrac{1}{\frac{7}{18}} = \dfrac{18}{7}$

366. (c) $\sin A - \cos A = \dfrac{\sqrt{3} - \sqrt{2}}{2}$

Squaring on both sides,

$\sin^2A + \cos^2A - 2\sin A\cos A = \dfrac{5 - 2\sqrt{6}}{4}$

$\Rightarrow 1 - \left(\dfrac{5 - 2\sqrt{6}}{4}\right) = 2\sin A.\cos A$

$\Rightarrow \dfrac{-1 + 2\sqrt{6}}{4} = 2\sin A.\cos A$

$\Rightarrow \sin A.\cos A = \dfrac{2\sqrt{6} - 1}{8}$

367. (c) Given, $(\sin\alpha + \cos\alpha) = \dfrac{2}{\sqrt{3}}$

Squaring both sides

$\Rightarrow \sin^2\alpha + \cos^2\alpha + 2\sin\alpha.\cos\alpha = \dfrac{4}{3}$

$\Rightarrow 1 + 2\sin\alpha.\cos\alpha = \dfrac{4}{3}$

$\Rightarrow 2\sin\alpha.\cos\alpha = \dfrac{1}{3} \Rightarrow \sin\alpha.\cos\alpha = \dfrac{1}{6}$

$\therefore \tan\alpha + \cot\alpha$

$= \dfrac{1}{\sin\alpha.\cos\alpha} = \dfrac{1}{\frac{1}{6}} = 6$

368. (b) $\sin\theta + \cos\theta = \dfrac{\sqrt{11}}{3}$

Squaring both sides

$\Rightarrow 1 + 2\sin\theta\cos\theta = \dfrac{11}{9}$

$\Rightarrow 2\sin\theta.\cos\theta = \dfrac{2}{9}$

$\Rightarrow \sin\theta.\cos\theta = \dfrac{1}{9}$

We know that,

$\tan\theta + \cot\theta = \dfrac{1}{\sin\theta.\cos\theta} = \dfrac{1}{\frac{1}{9}} = 9$

369. (a) $\tan\theta + \cot\theta$

$= \dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta} = \dfrac{1}{\sin\theta\cos\theta}$

Now,

$\sin\theta + \cos\theta = \dfrac{\sqrt{3} - 1}{2\sqrt{2}}$ ....(i)

squaring both sides in (i), we get

$\Rightarrow 1 + 2\sin\theta\cos\theta = \dfrac{4 - 2\sqrt{3}}{8}$

$\Rightarrow 2\sin\theta\cos\theta = \dfrac{4 - 2\sqrt{3} - 8}{8}$

$\Rightarrow 2\sin\theta\cos\theta = -\dfrac{(4 + 2\sqrt{3})}{8}$

$\Rightarrow \sin\theta\cos\theta = -\dfrac{(2 + \sqrt{3})}{8}$

$\therefore \tan\theta + \cot\theta = \left[\dfrac{-8}{2 + \sqrt{3}}\right]$

$= -8(2 - \sqrt{3}) = 8(\sqrt{3} - 2)$

370. (b) Given, $\sin t + \cos t = \frac{4}{5}$

Squaring both sides

$\Rightarrow (\sin t + \cos t)^2 = \left(\frac{4}{5}\right)^2$

$\Rightarrow \sin^2 t + \cos^2 t + 2\sin t.\cos t = \frac{16}{25}$

$\Rightarrow 1 + 2\sin t.\cos t = \frac{16}{25}$

$\Rightarrow 2\sin t.\cos t = \frac{16}{25} - 1$

$\Rightarrow \sin t.\cos t = \frac{-9}{50}$

371. (c) $f(p) = \sin^{p+2} x + \cos^{p+2} x$

$\therefore 6f(2) - 4\,f(4) + 10\,f(0) = 6\,(\sin^{2+2} x + \cos^4 x) - 4\,(\sin^6 x + \cos^6 x) + 10$

$= 6\,(1 - 2\sin^2 x\cos^2 x) - 4\,(1 - 3\sin^2 x\cos^2 x) + 10$

$= 6 - 12\sin^2 x\cos^2 x - 4 + 12\sin^2 x\cos x + 10 = 12$

372. (d) $x^2 - y^2 = (\tan A + \sin A)^2 - (\tan A - \sin A)^2$

$= 4\tan A\,\sin A$

$= 4 \times \frac{\sin A}{\cos A} \times \sin A = 4\frac{\sin^2 A}{\cos A}$

By options,

$4\sqrt{xy} = 4 \times \sqrt{\tan^2 A - \text{Sin}^2 A} = 4 \times \sqrt{\frac{\sin^2 A}{\cos^2 A} - \sin^2 A}$

$= 4 \times \sqrt{\frac{\sin^2 A(1 - \cos^2 A)}{\cos^2 A}}$

$= 4 \times \sqrt{\frac{\sin^4 A}{\cos^2 A}} = 4\frac{\sin^2 A}{\cos A}$

Alternate Method:

Put $A = 45°$

$x = 1 + \frac{1}{\sqrt{2}}, y = 1 - \frac{1}{\sqrt{2}}$

$x^2 - y^2 = 2\sqrt{2}$

By options,

$4\sqrt{xy} = 4 \times \sqrt{1 - \frac{1}{2}} = 4 \times \frac{1}{\sqrt{2}}$

$= 2\sqrt{2}$

373. (c) $\sin x + \sin y = a$

$\cos x + \cos y = b$

square both sides

$\sin^2 x + \sin^2 y + 2\sin x\sin y = a^2$ .....(i)

$\cos^2 x + \cos^2 y + 2\cos x\cos y = b^2$ .....(ii)

Adding (i) & (ii)

$a^2 + b^2 = \sin^2 x + \cos^2 x + \sin^2 y + \cos^2 y + 2\,[\sin x\sin y + \cos x\cos y]$

$\Rightarrow a^2 + b^2 = 1 + 1 + 2\,[\sin x\sin y + \cos x\cos y]$

$\Rightarrow \frac{a^2 + b^2 - 2}{2} = \sin x\sin y + \cos x\cos y$

Alternate Method:-

Put $x = y = 45°$

$\sin x + \sin y = a$

$\Rightarrow \sin 45° + \sin 45° = a \Rightarrow a = \sqrt{2}$

$\cos x + \cos y = b$

$\Rightarrow \cos 45° + \cos 45° = b \Rightarrow b = \sqrt{2}$

$\therefore \sin x\sin y + \cos x\cos y = \cos(x - y)$

$= \cos(45° - 45°) = \cos 0° = 1$

So, when we put value of $a = \sqrt{2}$ and $b = \sqrt{2}$ in option (c).

$\frac{a^2 + b^2 - 2}{2} = \frac{2 + 2 - 2}{2} = 1$

374. (a) $\cot^2\theta = 1 - e^2$

$\Rightarrow \text{cosec}^2\theta - 1 = 1 - e^2$

$\Rightarrow \text{cosec}^2\theta = 2 - e^2$

$\Rightarrow \text{cosec}\theta = \sqrt{2 - e^2}$

$\therefore \text{cosec}\,\theta + \cot^3\theta\sec\theta$

$= \frac{1}{\sin\theta} + \frac{\cos^2\theta}{\sin^3\theta}$

$= \frac{\cos^2\theta + \sin^2\theta}{\sin^3\theta} = \text{cosec}^3\theta$

$= \left(\sqrt{2 - e^2}\right)^3 = (2 - e^2)^{\frac{3}{2}}$

375. (c) $\sec\theta + \tan^3\theta\,\text{cosec}\theta$

$\Rightarrow \sec\theta + \tan^2\theta\sec\theta \Rightarrow \sec\theta(1 + \tan^2\theta)$

$\Rightarrow \sec^3\theta = ?$

Now,

$\tan^2\theta = 1 - a^2 \Rightarrow \sec^2\theta - 1 = 1 - a^2$

$\sec^2\theta = 2 - a^2$

$\sec^3\theta = (2 - a^2)^{\frac{3}{2}}$

Alternate Method:

$\tan^2\theta = 1 - a^2$

Put $\theta = 60° \Rightarrow 3 = 1 - a^2 \Rightarrow a^2 = -2$

$\therefore \sec\theta + \tan^3\theta \times \text{cosec}\theta = \sec 60° + \tan^3 60°\,\text{cosec}60°$

$= 2 + 3\sqrt{3} \times \frac{2}{\sqrt{3}} = 2 + 6 = 8$

Now go through options,

$(2 - a^2)^{\frac{3}{2}} = (2 + 2)^{\frac{3}{2}} = 4^{\frac{3}{2}}$

$= (2^2)^{\frac{3}{2}} = 2^3 = 8$

376. (d) $\tan^2\alpha = 3 + Q^2$

$\Rightarrow \sec^2\alpha - 1 = 3 + Q^2$

$\Rightarrow \sec^2\alpha = 4 + Q^2$

$\Rightarrow \sec\alpha = (4 + Q^2)^{\frac{1}{2}}$

$\therefore \sec\alpha + \tan^3\alpha\,\text{cosec}\alpha$

$= \sec\alpha + \tan^2\alpha\sec\alpha$

$= \sec\alpha[1 + \tan^2\alpha] = \sec^3\alpha = (4 + Q^2)^{\frac{3}{2}}$

Alternate Method:

$\tan^2\alpha = 3 + Q^2$

Put $\alpha = 45°$

$\tan^2 45° = 3 + Q^2$

$\Rightarrow Q^2 = -2$

$\therefore \sec 45° + \tan^3 45°\,\text{cosec}45°$

$= \sqrt{2} + 1 \times \sqrt{2} = 2\sqrt{2}$

Go through options,

$(4 + Q^2)^{\frac{3}{2}} = [4 + (-2)]^{\frac{3}{2}} = (2)^{\frac{3}{2}}$

$= 2\sqrt{2}$

377. (a) $(1 + \cot^2\theta)\,(1 + \tan^2\theta) \times (\sin\theta - \text{cosec}\theta)\,(\cos\theta - \sec\theta)$

$= \text{cosec}^2\theta\sec^2\theta$

$\times \left(\sin\theta - \frac{1}{\sin\theta}\right)\left(\cos\theta - \frac{1}{\cos\theta}\right)$

$= \frac{1}{\sin^2\theta} \times \frac{1}{\cos^2\theta} \times \frac{(\sin^2\theta - 1)}{\sin\theta} \times \frac{\cos^2\theta - 1}{\cos\theta}$

$= \frac{1}{\sin^2\theta\cos^2\theta} \times \frac{\cos^2\theta}{\sin\theta} \times \frac{\sin^2\theta}{\cos\theta}$

$= \sec\theta\,\text{cosec}\theta$

Alternate Method:

$(1 + \cot^2\theta)\,(1 + \tan^2\theta)\,(\sin\theta - \text{cosec}\theta)\,(\cos\theta - \sec\theta)$

Put $\theta = 45°$

$(1 + 1)\,(1 + 1)\left(\frac{1}{\sqrt{2}} - \sqrt{2}\right)\left(\frac{1}{\sqrt{2}} - \sqrt{2}\right)$

$= 4\left(\frac{1 - 2}{\sqrt{2}}\right)\left(\frac{1 - 2}{\sqrt{2}}\right) = 4\left(\frac{-1}{\sqrt{2}}\right)\left(\frac{-1}{\sqrt{2}}\right) = 2$

Go through options,

$\sec\theta\,\text{cosec}\theta = \sec 45°\,\text{cosec}45°$

$= \sqrt{2} \times \sqrt{2} = 2$

378. (c) $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$

$\Rightarrow x\sin^2\theta\sin\theta + y\cos^3\theta = \sin\theta\cos\theta$

$\Rightarrow y\cos\theta\sin^2\theta + y\cos^3\theta = \sin\theta\cos\theta$

$(\because x\sin\theta = y\cos\theta)$

$\Rightarrow y\cos\theta\,(\sin^2\theta + \cos^2\theta) = \sin\theta\cos\theta$

$y = \sin\theta$ .....(i)

$x\sin\theta = y\cos\theta$

$\Rightarrow x\sin\theta = \sin\theta\cos\theta$

$\Rightarrow x = \cos\theta$ ......(ii)

$\because x^2 + y^2 = \sin^2\theta + \cos^2\theta = 1$

Alternate Method:

Put $\theta = 45°$

$x\sin\theta = y\cos\theta \Rightarrow x = y$

$\therefore x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$

$\Rightarrow 2x\sin^3\theta = \sin^2\theta$

$\Rightarrow 2x\sin\theta = 1$

$\Rightarrow \frac{2x}{\sqrt{2}} = 1 \Rightarrow x = \frac{1}{\sqrt{2}} = y$

$\therefore x^2 + y^2 = \frac{1}{2} + \frac{1}{2} = 1$

SMART APPROACH:-

$x\sin^3\theta + y\cos^3\theta = \sin\theta.\cos\theta$

$\frac{x}{\cos\theta} \times \sin^2\theta + \frac{y}{\sin\theta} \times \cos^2\theta = 1$

So,

$\frac{x}{\cos\theta} = 1$ and $\frac{y}{\sin\theta} = 1$

$x = \cos\theta$ and $y = \sin\theta$

$x^2 + y^2 = \cos^2\theta + \sin^2\theta = 1$

379. (b) $a\sin X = b\cos X$ ... (i)

from (i) -

$b\cos X\sin^2 X + b\cos^3 X = \sin X\cos X$

$\Rightarrow b\cos X\,(\sin^2 X + \cos^2 X) = \sin X\cos X$

$\Rightarrow b = \sin X$

Similarly, $a = \cos X$

$\therefore a^2 + b^2 = \sin^2 X + \cos^2 X = 1$

Alternate Method:

$a\sin X = b\cos X$

Put, $X = 45°$

$\Rightarrow a = b$

$a\sin^3 X + b\cos^3 X = \sin X\cos X$

$\Rightarrow a \times \frac{1}{2\sqrt{2}} + b \times \frac{1}{2\sqrt{2}} = \frac{1}{2}$

$\Rightarrow a + b = \sqrt{2}$

$\Rightarrow a = \frac{1}{\sqrt{2}}, b = \frac{1}{\sqrt{2}}$

$\therefore a^2 + b^2 = \sin^2 X + \cos^2 X = 1$

SMART APPROACH:-

If $a\sin X = b\cos X$ and

$a\sin^3 X + b\cos^3 X = c\sin X\cos X$

Then, $a^2 + b^2 = c^2$

380. (d) $\left(\frac{\sin A}{1-\cos A}+\frac{1-\cos A}{\sin A}\right)\div\left(\frac{\cot^2 A}{1+\operatorname{cosec} A}+1\right)$

$$=\left(\frac{\sin A}{1-\cos A}\times\frac{1+\cos A}{1+\cos A}+\frac{1-\cos A}{\sin A}\right)$$

$[\because 1-\cos^2A=\sin^2A]$

$$=\left(\frac{\sin A(1+\cos A)}{\sin^2A}+\frac{1-\cos A}{\sin A}\right)$$

$$=\frac{(1+\cos A)+(1-\cos A)}{\sin A}$$

$$=\frac{2}{\sin A}=2\operatorname{cosec}A \quad \text{....(i)}$$

Now, $\left(\frac{\cot^2A}{1+\operatorname{cosec}A}+1\right)$

$(\because \operatorname{cosec}^2A-\cot^2A=1)$

$$=\frac{(\operatorname{cosec}A-1)(\operatorname{cosec}A+1)}{(1+\operatorname{cosec}A)}+1$$

$= \operatorname{cosec}A - 1 + 1 = \operatorname{cosec}A$ ....(ii)

$\therefore 2\operatorname{cosec}A + \operatorname{cosec}A = 2$

Alternate Method:

Put $\theta = 45°$

$$\left(\frac{\sin 45°}{1-\cos 45°}+\frac{1-\cos 45°}{\sin 45°}\right)$$

$$\div\left(\frac{\cot^2 45°}{1+\operatorname{cosec}45°}+1\right)$$

$$=\left(\frac{\frac{1}{\sqrt2}}{1-\frac{1}{\sqrt2}}+\frac{1-\frac{1}{\sqrt2}}{\frac{1}{\sqrt2}}\right)\div\left(\frac{1}{1+\sqrt2}+1\right)$$

$$=\left(\frac{1}{\sqrt2}\times\frac{\sqrt2}{\sqrt2-1}+\frac{\sqrt2-1}{\sqrt2}\times\sqrt2\right)\div\left(\frac{1+1+\sqrt2}{\sqrt2+1}\right)$$

$$=(\sqrt2+1+\sqrt2-1)\div\left(\frac{2+\sqrt2}{\sqrt2+1}\right)=\frac{2\sqrt2}{\sqrt2}=2$$

381. (b)

$$\frac{\sec^2\theta(2+\tan^2\theta+\cot^2\theta)\div(\sin^2\theta-\tan^2\theta)}{(\operatorname{cos ec}^2\theta+\sec^2\theta)(1+\cot^2\theta)^2}$$

$[\because \tan^2\theta - \sin^2\theta = \tan^2\theta \times \sin^2\theta]$

$1 + \tan^2\theta = \sec^2\theta$

$1 + \cot^2\theta = \operatorname{cosec}^2\theta]$

$$=\frac{\sec^2\theta(1+\tan^2\theta+1+\cot^2\theta)\div(\sin^2\theta\times\tan^2\theta)}{(\operatorname{cos ec}^2\theta+\sec^2\theta)(\operatorname{cos ec}^2)^2}$$

$$=\frac{\sec^2\theta(\sec^2\theta+\operatorname{cos ec}^2\theta)}{(\sin^2\theta\times\tan^2\theta)(\operatorname{cos ec}^2\theta+\sec^2\theta)(\operatorname{cos ec}^2\theta)^2}$$

$$=\frac{\sec^2\theta\times\sin^2\theta}{\tan^2\theta}$$

$$=\frac{\tan^2\theta}{\tan^2\theta}=1$$

382. (d) $\frac{2+\tan^2 2A+\cot^2 2A}{\sec 2A.\operatorname{cos ec}2A}$

$$=\frac{1+\tan^2 2A+1+\cot^2 2A}{\sec 2A.\ \operatorname{cosec}2A}$$

$$=\frac{\sec^2 2A+\operatorname{cosec}^2 2A}{\sec 2A.\ \operatorname{cosec}2A}$$

$$=\frac{\sec^2 2A\times\operatorname{cosec}^2 2A}{\sec 2A\times\operatorname{cosec}2A}$$

$= \sec 2A\ \operatorname{cosec}2A$

Note: $\sec^2\theta + \operatorname{cosec}^2\theta = \sec^2\theta.\operatorname{cosec}^2\theta$

383. (d)

$$\left(\frac{\sin\theta-2\sin^3\theta}{2\cos^3\theta-\cos\theta}\right)^3\frac{1}{\tan\theta}-\sec^2\theta$$

$$=\left(\frac{\sin\theta}{\cos\theta}\frac{(1-2\sin^2\theta)}{(2\cos^2\theta-1)}\right)^3\times\frac{1}{\tan\theta}-\sec^2\theta$$

$$=(\tan\theta)^3\times\frac{1}{\tan\theta}-\sec^2\theta$$

$= \tan^2\theta - \sec^2\theta = -1$

Note: $\cos 2\theta = 1 - 2\sin^2\theta = 2\cos^2\theta - 1$

Alternate Method:

For $\theta = 45°$, given value is not defined

$\therefore$ Put $\theta = 30°$

$$\left(\frac{\frac12-2\times\frac18}{2\times\left(\frac{\sqrt3}{2}\right)^3-\frac{\sqrt3}{2}}\right)^3\times\sqrt3-\left(\frac{2}{\sqrt3}\right)^2$$

$$=\left(\frac{\frac14}{\frac{3\sqrt3-2\sqrt3}{4}}\right)^3\times\sqrt3-\frac43$$

$$=\frac{1}{3\sqrt3}\times\sqrt3-\frac43=\frac13-\frac43=-1$$

384. (b)

$$\frac{\sin A}{\cot A+\operatorname{cosec}A}-\frac{\sin A}{\cot A-\operatorname{cosec}A}-1$$

$$=\sin A\left(\frac{1}{\cot A+\operatorname{cosec}A}-\frac{1}{\cot A-\operatorname{cosec}A}\right)-1$$

$$=\sin A\left(\frac{\cot A-\operatorname{cosec}A-\cot A-\operatorname{cosec}A}{(\cot A+\operatorname{cosec}A)(\cot A-\operatorname{cosec}A)}\right)-1$$

$$=\sin A\left(\frac{-2\operatorname{cosec}A}{\cot^2A-\operatorname{cosec}^2A}\right)-1$$

$$=\frac{-2\sin A\operatorname{cosec}A}{-(\operatorname{cosec}^2A-\cot^2A)}-1=2-1=1$$

Alternate Method:

Put $A = 45°$

$$\frac{\sin 45°}{\cot 45°+\operatorname{cos ec}45°}-\frac{\sin 45°}{\cot 45°-\operatorname{cos ec}45°}-1$$

$$=\frac{\frac{1}{\sqrt2}}{1+\sqrt2}-\frac{\frac{1}{\sqrt2}}{1-\sqrt2}-1$$

$$=\frac{1}{\sqrt2(\sqrt2+1)}+\frac{1}{\sqrt2(\sqrt2-1)}-1$$

$$=\frac{\sqrt2-1+\sqrt2+1}{\sqrt2}-1=\frac{2\sqrt2}{\sqrt2}-1=1$$

385. (a) $\left[\frac{\tan^3\theta}{\sec^2\theta}+\frac{\cot^3\theta}{\operatorname{cos ec}^2\theta}+2\sin\theta\cos\theta\right]\div$

$(1 + \operatorname{cosec}^2\theta + \tan^2\theta)$

Consider, Numerator:-

$$\frac{\frac{\sin^3\theta}{\cos^3\theta}}{\frac{1}{\cos^2\theta}}+\frac{\frac{\cos^3\theta}{\sin^3\theta}}{\frac{1}{\sin^2\theta}}+2\sin\theta\cos\theta$$

$$=\frac{\sin^3\theta}{\cos\theta}+\frac{\cos^3\theta}{\sin\theta}+2\sin\theta\cos\theta$$

$$=\frac{\sin^4\theta+\cos^4\theta+2\sin^2\theta\cos^2\theta}{\cos\theta\sin\theta}$$

$$=\frac{\left[\sin^2\theta+\cos^2\theta\right]^2}{\cos\theta\sin\theta}=\frac{1}{\cos\theta\sin\theta}$$

Consider Denominator:

$1 + \operatorname{cosec}^2\theta + \tan^2\theta$

$$=1+\frac{1}{\sin^2\theta}+\frac{\sin^2\theta}{\cos^2\theta}$$

$$=\frac{\sin^2\theta\cos^2\theta+\cos^2\theta+\sin^4\theta}{\sin^2\theta\cos^2\theta}$$

$$=\frac{\sin^2\theta(\cos^2\theta+\sin^2\theta)+\cos^2\theta}{\sin^2\theta\cos^2\theta}$$

$$=\frac{1}{\sin^2\theta\cos^2\theta}$$

After combining,

$$\frac{\frac{1}{\cos\theta\sin\theta}}{\frac{1}{\sin^2\theta\cos^2\theta}}=\frac{\sin^2\theta\cos^2\theta}{\sin\theta\cos\theta}=\sin\theta\cos\theta$$

Alternate Method :-

Put $\theta = 45°$

$$\left(\frac{\tan^3 45°}{\sec^2 45°}+\frac{\cot^3 45°}{\operatorname{cosec}^2 45°}+2\sin 45°\cos 45°\right)$$

$\div (1 + \operatorname{cosec}^2 45° + \tan^2 45°)$

$$=\left(\frac12+\frac12+\frac22\right)\div(1+2+1)$$

$$=(1+1)\div 4=\frac24=\frac12$$

Go through options,

$$\sin\theta\cos\theta=\sin 45°\cos 45°=\frac12$$

386. (b)

$$\frac{(1+\sec\theta\operatorname{cos ec}\theta)^2\times(\sec\theta-\tan\theta)^2(1+\sin\theta)}{(\sin\theta+\sec\theta)^2+(\cos\theta+\operatorname{cos ec}\theta)^2}$$

$$=\frac{\left(1+\frac{1}{\cos\theta\sin\theta}\right)^2\left(\frac{1}{\cos\theta}-\frac{\sin\theta}{\cos\theta}\right)^2(1+\sin\theta)}{\left(\sin\theta+\frac{1}{\cos\theta}\right)^2+\left(\cos\theta+\frac{1}{\sin\theta}\right)^2}$$

$$=\frac{\frac{(\cos\theta\sin\theta+1)^2}{\cos^2\theta\sin^2\theta}\left(\frac{1-\sin\theta}{\cos\theta}\right)^2(1+\sin\theta)}{\frac{(\cos\theta\sin\theta+1)^2}{\cos^2\theta}+\frac{(\cos\theta\sin\theta+1)^2}{\sin^2\theta}}$$

$$=\frac{\frac{(1-\sin^2\theta)(1-\sin\theta)}{\cos^2\theta\sin^2\theta\cos^2\theta}}{\frac{1}{\cos^2\theta\sin^2\theta}}=\frac{\cos^2\theta(1-\sin\theta)}{\cos^2\theta}$$

$= 1 - \sin\theta$

Alternate Method:

$$\frac{(1+\sec\theta\operatorname{cosec}\theta)^2(\sec\theta-\tan\theta)^2(1+\sin\theta)}{(\sin\theta+\sec\theta)^2+(\cos\theta+\operatorname{cosec}\theta)^2}$$

With the help of triplet 3, 4, 5 (P, B, H)

$$\frac{\left(1+\frac54\times\frac53\right)^2\left(\frac54-\frac34\right)^2\left(1+\frac35\right)}{\left(\frac35+\frac54\right)^2+\left(\frac45+\frac53\right)^2}$$

$$=\frac{\left(1+\frac{25}{12}\right)^2\times\frac{1}{4}\times\frac{8}{5}}{\left(\frac{12+25}{20}\right)^2+\left(\frac{12+25}{15}\right)^2}$$

$$=\frac{\frac{1}{144}\times\frac{2}{5}}{\frac{1}{400}+\frac{1}{225}}=\frac{1}{72\times5}\times\frac{400\times225}{625}$$

$$=\frac{2}{5}$$

Go through option (b)

$$\therefore\ 1-\sin\theta=1-\frac{3}{5}=\frac{2}{5}$$

387. (a) $\frac{\cot^3\theta}{\operatorname{cosec}^2\theta}+\frac{\tan^3\theta}{\sec^2\theta}+2\sin\theta\cos\theta$

$$=\frac{\cos^3\theta}{\sin\theta}+\frac{\sin^3\theta}{\cos\theta}+2\sin\theta\cos\theta$$

$$=\frac{\cos^4\theta+\sin^4\theta+2\cos^2\theta\sin^2\theta}{\sin\theta\cos\theta}$$

$$=\frac{(\cos^2\theta+\sin^2\theta)^2}{\sin\theta\cos\theta}$$

$$=\frac{1}{\sin\theta\cos\theta}=\operatorname{cosec}\theta.\sec\theta$$

Alternate Method:-

$$\frac{\cot^3\theta}{\operatorname{cosec}^2\theta}+\frac{\tan^3\theta}{\sec^2\theta}+2\sin\theta\cos\theta$$

put $\theta=30^\circ$

$$=\frac{3\sqrt{3}}{4}+\frac{1\times3}{3\sqrt{3}\times4}+\frac{\sqrt{3}}{2}=\frac{9+1+6}{4\sqrt{3}}=\frac{4}{\sqrt{3}}$$

Go through options,

$$\operatorname{cosec}30^\circ.\sec30^\circ=2\times\frac{2}{\sqrt{3}}=\frac{4}{\sqrt{3}}$$

388. (c)

$$\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}\left[\frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-\sin^2\theta}\right]$$

$$=\frac{1}{\sin\theta\cos\theta}\left[\frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-1+\cos^2\theta}\right]$$

$$=\frac{1}{\cos\theta}\left[\frac{\sin\theta(1+\cos\theta)}{\cos\theta(1+\cos\theta)}\right]=\sec^2\theta$$

Alternate Method:-

$$\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}\left[\frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-\sin^2\theta}\right]$$

put $\theta=30^\circ$

$$\sqrt{\left(\frac{4}{3}+4\right)}\left[\frac{\frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right)}{1+\frac{\sqrt{3}}{2}-\frac{1}{4}}\right]$$

$$=\frac{4}{\sqrt{3}}\left[\frac{\frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right)}{\frac{3}{4}+\frac{\sqrt{3}}{2}}\right]=\frac{4}{2\sqrt{3}}\left[\frac{1+\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}}{2}\left(1+\frac{\sqrt{3}}{2}\right)}\right]$$

$$=\frac{4}{2\sqrt{3}}\times\frac{2}{\sqrt{3}}=\frac{4}{3}=\sec^2 30^\circ$$

389. (a) $\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$

$$=\frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{(1+\sin A+\cos A)(1+\sin A-\cos A)}$$

$$=\frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{(1+\sin A)^2-\cos^2A}$$

$$=\frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{(1+\sin^2A+2\sin A-\cos^2A)}$$

$$=\frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{2\sin^2A+2\sin A}$$

$$=\frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{2\sin A(\sin A+1)}$$

$$=1+\sin A-\cos A$$

Alternate Method:

$$\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$$

Put $\theta=90^\circ$; $\frac{2\times1(1+1)}{1+1+0}=\frac{2\times2}{2}=2$

Check option, option (a)

$1+\sin A-\cos A=1+1-0=2$

390. (d)

$$\frac{\sin\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$$

$$=\frac{\sin\phi(1-\sin\phi)(\sin\phi+\cos\phi)\left(\frac{1}{\cos\phi}+\frac{\sin\phi}{\cos\phi}\right)}{\sin\phi\left(1+\frac{\sin\phi}{\cos\phi}\right)+\cos\phi\left(1+\frac{\cos\phi}{\sin\phi}\right)}$$

$$=\frac{\sin\phi(1-\sin\phi)(\sin\phi+\cos\phi)\left(\frac{(1+\sin\phi)}{\cos\phi}\right)}{\sin\phi\frac{(\cos\phi+\sin\phi)}{\cos\phi}+\cos\phi\left(\frac{\sin\phi+\cos\phi}{\sin\phi}\right)}$$

$$=\frac{\frac{\sin\phi\left(1-\sin^2\phi\right)}{\cos\phi}}{\frac{\sin^2\phi+\cos^2\phi}{\sin\phi\cos\phi}}=\frac{\frac{\sin\phi\cos^2\phi}{\cos\phi}}{\frac{1}{\sin\phi\cos\phi}}$$

$$=\sin^2\phi\cos^2\phi$$

Alternate Method:

$\phi=45^\circ$

$$\frac{\frac{1}{\sqrt{2}}\left(\frac{\sqrt{2}-1}{\sqrt{2}}\right)\times\sqrt{2}\times(\sqrt{2}+1)}{\frac{1}{\sqrt{2}}\times2+\frac{1}{\sqrt{2}}\times2}=\frac{1}{4}$$

Go through option $\sin^2\phi\cos^2\phi=\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$

Hence, option (d) satisfies.

391. (d)

$$\frac{1+\cos\theta-\sin^2\theta}{\sin\theta(1+\cos\theta)}\times\frac{\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}}{\tan\theta+\cot\theta}$$

$$=\frac{\cos\theta(1+\cos\theta)}{\sin\theta(1+\cos\theta)}\times\frac{\sqrt{\frac{1}{\cos^2\theta}+\frac{1}{\sin^2\theta}}}{\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}}$$

$$=\cot\theta\times\frac{\frac{1}{\cos\theta\sin\theta}}{\frac{1}{\cos\theta\sin\theta}}=\cot\theta$$

Alternate Method:-

Put $\theta=30^\circ$

$$\frac{1+\cos30^\circ-\sin^2 30^\circ}{\sin30^\circ(1+\cos30^\circ)}\times\frac{\sqrt{\sec^2 30^\circ+\operatorname{cosec}^2 30^\circ}}{\tan30^\circ+\cot30^\circ}$$

$$=\frac{1+\frac{\sqrt{3}}{2}-\frac{1}{4}}{\frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right)}\times\frac{\sqrt{\frac{4}{3}+4}}{\frac{1}{\sqrt{3}}+\sqrt{3}}$$

$$=\frac{4+2\sqrt{3}-1}{4}\times\frac{4}{2+\sqrt{3}}\times\frac{\sqrt{\frac{16}{3}}}{\frac{4}{\sqrt{3}}}$$

$$=\frac{3+2\sqrt{3}}{2+\sqrt{3}}\times\frac{4}{\sqrt{3}}\times\frac{\sqrt{3}}{4}=\frac{\sqrt{3}(2+\sqrt{3})}{2+\sqrt{3}}=\sqrt{3}$$

Go through options,

$\cot30^\circ=\sqrt{3}$

392. (d) $\frac{(\tan^6\theta-\sec^6\theta)+3\sec^2\theta.\tan^2\theta}{\tan^2\theta+\cot^2\theta+2}$

$$=\frac{(\tan^2\theta-\sec^2\theta)[\tan^4\theta+\sec^4\theta+\sec^2\theta\tan^2\theta]+3\sec^2\theta\tan^2\theta}{(1+\tan^2\theta+1+\cot^2\theta)}$$

$$=\frac{-[1+3\sec^2\theta\tan^2\theta]+3\sec^2\theta.\tan^2\theta}{(1+\tan^2\theta)(1+\cot^2\theta)}$$

$$=\frac{-1}{\sec^2\theta.\operatorname{cosec}^2\theta}=-\sin^2\theta.\cos^2\theta$$

Alternate Method:-

Put $\theta=45^\circ$

$$\frac{\tan^6 45^\circ-\sec^6 45^\circ+3\sec^2 45^\circ\tan^2 45^\circ}{\tan^2 45^\circ+\cot^2 45^\circ+2}$$

$$=\frac{1-8+3\times2}{1+1+2}=\frac{1-8+6}{4}=\frac{-1}{4}$$

Go through options,

$$-\sin^2 45^\circ\cos^2 45^\circ=\frac{-1}{2}\times\frac{1}{2}=\frac{-1}{4}$$

393. (a) $\frac{\sec^6\theta-\tan^6\theta-3\sec^2\theta\tan^2\theta+1}{\cos^4\theta-\sin^4\theta+2\sin^2\theta+2}$

$$=\frac{\left(\sec^2\theta-\tan^2\theta\right)^3+1}{\left(\cos^2\theta+\sin^2\theta\right)\left(\cos^2\theta-\sin^2\theta\right)+2\sin^2\theta+2}$$

$$=\frac{1+1}{\cos^2\theta-\sin^2\theta+2\sin^2\theta+2}$$

$$=\frac{2}{\cos^2\theta+\sin^2\theta+2}=\frac{2}{1+2}=\frac{2}{3}$$

Alternate Method:

Put $\theta=0^\circ$,

$$=\frac{1-0-0+1}{1-0+0+2}=\frac{2}{3}$$

394. (b)

$$\frac{\cos^4\theta-\sin^4\theta+2\sin^2\theta+3}{(\operatorname{cosec}\theta+\cot\theta+1)(\operatorname{cosec}\theta-\cot\theta+1)-2}$$

$$=\frac{(\cos^2\theta-\sin^2\theta)(\cos^2\theta+\sin^2\theta)+2\sin^2\theta+3}{(\operatorname{cosec}\theta+1)^2-\cot^2\theta-2}$$

$$=\frac{\cos^2\theta-\sin^2\theta+2\sin^2\theta+3}{\operatorname{cosec}^2\theta+1+2\operatorname{cosec}\theta-\cot^2\theta-2}$$

$$=\frac{\cos^2\theta+\sin^2\theta+3}{2\operatorname{cosec}\theta}$$

$$=\frac{1+3}{2\operatorname{cosec}\theta}=\frac{4}{2\operatorname{cosec}\theta}=2\sin\theta$$

Alternate Method:-

Put $\theta=60^\circ$

$$\frac{\cos^4 60^\circ-\sin^4 60^\circ+2\sin^2 60^\circ+3}{(\operatorname{cosec}60^\circ+\cot60^\circ+1)(\operatorname{cosec}60^\circ-\cot60^\circ+1)-2}$$

$$=\frac{\left(\frac{1}{16}-\frac{9}{16}\right)+2\times\frac{3}{4}+3}{\left(\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{3}}+1\right)\left(\frac{2}{\sqrt{3}}-\frac{1}{\sqrt{3}}+1\right)-2}$$

$$=\frac{\frac{-1}{2}+\frac{3}{2}+3}{(\sqrt{3}+1)\frac{(\sqrt{3}+1)}{\sqrt{3}}-2}$$

$$=\frac{4\times\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}}=\frac{4\sqrt{3}}{4}=\sqrt{3}$$

Go through options,

$$2\sin\theta = 2\times\sin 60° = 2\times\frac{\sqrt{3}}{2}=\sqrt{3}$$

395. (d)

$$\frac{(1-\sin\theta+\cos\theta)^2(1-\cos\theta)\sec^3\theta\operatorname{cosec}^2\theta}{(\sec\theta-\tan\theta)\tan\theta+\cot\theta}$$

$$=\frac{[1+\sin^2\theta-2\sin\theta+\cos^2\theta+2\cos\theta(1-\sin\theta)]\frac{1-\cos\theta}{\cos^3\theta}\frac{1}{\sin^2\theta}}{\left(\frac{1}{\cos\theta}-\frac{\sin\theta}{\cos\theta}\right)\left(\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}\right)}$$

$$=\frac{[2(1-\sin\theta)+2\cos\theta(1-\sin\theta)]\frac{(1-\cos\theta)}{\cos^3\theta\sin^2\theta}}{\frac{(1-\sin\theta)}{\cos\theta}\left(\frac{1}{\cos\theta\sin\theta}\right)}$$

$$=\frac{\frac{2(1-\sin\theta)(1+\cos\theta)(1-\cos\theta)}{\cos^3\theta\sin^2\theta}}{\frac{(1-\sin\theta)}{\cos^2\theta\sin^2\theta}}$$

$$=2\frac{\sin\theta}{\cos\theta}=2\tan\theta$$

Alternate Method:-

Put $\theta = 45°$

$$\frac{(1-\sin45°+\cos45°)^2(1-\cos45°)\sec^3 45°\operatorname{cosec}^2 45°}{(\sec45°-\tan45°)(\tan45°+\cot45°)}$$

$$=\frac{1\times\left(1-\frac{1}{\sqrt{2}}\right)\times2\sqrt{2}\times2}{(\sqrt{2}-1)\times2}=\frac{(\sqrt{2}-1)\times4\sqrt{2}}{\sqrt{2}\times2(\sqrt{2}-1)}=2$$

Go through options,

$2\tan45° = 2 \times 1 = 2$

396. (b)

$$=\frac{(1-2\sin^2\theta.\cos^2\theta)(1+\cot\theta)\cos\theta}{(\sin^4\theta+\cos^4\theta)(1+\tan\theta)\operatorname{cosec}\theta}-1$$

$$=\frac{(1-2\sin^2\theta.\cos^2\theta)(1+\tan\theta)\cos\theta}{\tan\theta(1-2\sin^2\theta.\cos^2\theta)(1+\tan\theta)\operatorname{cosec}\theta}-1$$

$$=\frac{\sin\theta.\cos\theta\times\cos\theta}{\sin\theta}-1$$

$= -\sin^2\theta$

use $[\sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta.\cos^2\theta]$

Alternate Method:-

Put $\theta = 45°$

$$\frac{(1-2\sin^2 45°\cos^2 45°)(\cot45°+1)\cos45°}{(\sin^4 45°+\cos^4 45°)(1+\tan45°)\operatorname{cosec}45°}-1$$

$$=\frac{\left(1-2\times\frac{1}{2}\times\frac{1}{2}\right)(2)\times\frac{1}{\sqrt{2}}}{\left(\frac{1}{4}+\frac{1}{4}\right)\times2\times\sqrt{2}}-1$$

$$=\frac{\left(1-\frac{1}{2}\right)\times\sqrt{2}}{\frac{1}{2}\times2\sqrt{2}}-1=\frac{\frac{1}{\sqrt{2}}}{\sqrt{2}}-1=\frac{1}{2}-1=\frac{-1}{2}$$

Go through options,

$$-\sin^2 45° = \frac{-1}{2}$$

397. (b) $\cot^4\theta - \cot^2\theta = 1$

$\Rightarrow \cot^4\theta = 1 + \cot^2\theta$

$\Rightarrow \cot^4\theta = \operatorname{cosec}^2\theta$

$$\Rightarrow \frac{\cos^4\theta}{\sin^4\theta}=\frac{1}{\mathrm{Sin}^2\theta}$$

$\Rightarrow \cos^4\theta = \sin^2\theta$ .....(i)

$\therefore \cos^4\theta + \cos^2\theta$

$= \sin^2\theta + \cos^2\theta = 1$ (From equation (i))

398. (b) We know, $\cot^2A + 1 = \operatorname{cosec}^2A$

Given, $\cot^4 A + \cot^2 A = 1$

$\Rightarrow \cot^2A\,(1 + \cot^2A) = 1$

$\Rightarrow \cot^2A = \sin^2A$

$\Rightarrow \cos^2A = \sin^4 A$ ..... (i)

$\therefore (\cos^2A)^2 - 3\cos^2A$

$= (1 - \sin^2A)^2 - 3\cos^2A$

$= (1 + \sin^4A - 2\sin^2 A - 3\cos^2A$

$= 1 + \cos^2A - 2\sin^2 A - 3\cos^2A$

$= 1 - 2\,(\sin^2 A + \cos^2A) = 1 - 2 = -1$

399. (c) $\sin A + \sin^2A = 1$

$\Rightarrow \sin A = 1 - \sin^2A$

$\Rightarrow \sin A = \cos^2A$

and $\cos^6A = \sin^3A$

$\cos^4A = \sin^2A$

$\therefore \cos^4A + \cos^6A = \sin^2A + \sin^3A$

$= \sin A\,(\sin A + \sin^2A)$

$= \sin A \times 1 = \sin A$

400. (b) Given,

$\sin A + \sin^2A = 1$

$\Rightarrow \sin A = 1 - \sin^2A \Rightarrow \sin A = \cos^2A$

$\therefore \cos^2A + \cos^4A = \cos^2A + \sin^2A = 1$

401. (a) $\sin x + \sin^2x = 1,$

$\Rightarrow \sin x = 1 - \sin^2x$

$\Rightarrow \sin x = \cos^2x$

$\therefore \cos^8x + 2\cos^6x + \cos^4x$

$= (\cos^4x + \cos^2x)^2 = (\sin^2x + \cos^2x)^2$

$= (1)^2 = 1$

402. (d) $\sin^4 x + \sin^2 x = 1$

$\Rightarrow (\sin^2 x\,\sin^2x) = 1 - \sin^2x$

$$\Rightarrow \sin^2x=\frac{\cos^2x}{\sin^2x}$$

$\Rightarrow \sin^2x = \cot^2x$

$\therefore \cot^4x + \cot^2x = \sin^4x + \sin^2x = 1$

403. (d) $\cos A + \cos^2A = 1$

$\Rightarrow \cos A = 1 - \cos^2A$

$\Rightarrow \cos A = \sin^2A$

Squaring on both side

$\Rightarrow \cos^2A = \sin^4A$

$\therefore \sin^2A + \sin^4A = \sin^2A + \cos^2A = 1$

404. (b) Given, $\cos A + \cos^2A = 1$

$\Rightarrow 1 - \cos^2A = \cos A$

$\Rightarrow \sin^2A = \cos A$

$\therefore \sin^4A + \sin^6A$

$= \cos^2A + \cos^3A = \cos A(\cos A + \cos^2A)$

$= \cos A \times 1 = \cos A$

405. (d) $\tan^4\theta + \tan^2\theta = 1$

$\Rightarrow \tan^2\theta\,(\tan^2\theta + 1) = 1$

$\Rightarrow \tan^2\theta \times \sec^2\theta = 1$

$$\Rightarrow \frac{\sin^2\theta}{\cos^2\theta}\times\frac{1}{\cos^2\theta}=1$$

$\Rightarrow \sin^2\theta = \cos^4\theta$

$\therefore 11(\cos^4\theta + \cos^2\theta)$

$= 11(\sin^2\theta + \cos^2\theta) = 11 \times 1 = 11$

406. (a) Given,

$a\sin^{12}A + b\sin^{10}A + c\sin^8A + \sin^6A = 1$ ....(i)

$\cos A = \sin^2A$

squaring both sides:

$\Rightarrow \cos^2A = \sin^4A \Rightarrow 1 - \sin^2A = \sin^4A$

$\Rightarrow 1 = \sin^4A + \sin^2A$

cubing both sides:

$\Rightarrow 1 = (\sin^4A + \sin^2A)^3$

$\Rightarrow 1 = \sin^{12}A + \sin^6A + 3\sin^4A\,\sin^2A\,(\sin^4A + \sin^2A)$

$\Rightarrow 1 = \sin^{12}A + \sin^6A + 3\sin^{10}A + 3\sin^8A$

$\Rightarrow \sin^{12}A + 3\sin^{10}A + 3\sin^8A + \sin^6A = 1$ .....(ii)

On comparing (i) and (ii), we get a $= 1$, b $= 3$ and c $= 3$

$\therefore$ Hence, $a + b + c = 7$

407. (a) Given,

$\sin^2\theta = \cos^3\theta$

Squaring both sides

$\sin^4\theta = \cos^6\theta$ ....(i)

$$\cot^2\theta-\cot^6\theta=\cot^2\theta-\frac{\cos^6\theta}{\sin^6\theta}$$

From equation (i),

$$=\cot^2\theta-\frac{\sin^4\theta}{\sin^6\theta}=\cot^2\theta-\frac{1}{\sin^2\theta}$$

$= \cot^2\theta - \operatorname{cosec}^2\theta$

$= -\left(\operatorname{cosec}^2\theta - \cot^2\theta\right) = -1$

408. (a)

$$\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}=\sqrt{\frac{(1+\sin\theta)^2}{1-\sin^2\theta}}$$

$$=\frac{1+\sin\theta}{\cos\theta}=\sec\theta+\tan\theta$$

409. (d)

$$\frac{\sqrt{1-\sin A}}{\sqrt{1+\sin A}}$$

$$=\frac{\sqrt{(1-\sin A)\times(1-\sin A)}}{\sqrt{(1-\sin^2A)}}=\frac{\sqrt{(1-\sin A)^2}}{\cos A}$$

$$=\frac{1-\sin A}{\cos A}=\sec A-\tan A$$

410. (a) Put $\theta = 30°$

$$\frac{(\sin30°+\cos30°-1)}{(\sin30°-\cos30°+1)}\times\frac{1+\sin30°}{\cos30°}$$

$$=\frac{\left(\frac{1}{2}+\frac{\sqrt{3}}{2}-1\right)}{\left(\frac{1}{2}-\frac{\sqrt{3}}{2}+1\right)}\times\frac{1+\frac{1}{2}}{\frac{\sqrt{3}}{2}}$$

$$=\frac{\sqrt{3}-1}{3-\sqrt{3}}\times\sqrt{3}=\frac{\sqrt{3}-1}{3-\sqrt{3}}\times\frac{3+\sqrt{3}}{3+\sqrt{3}}\times\sqrt{3}$$

$$=\frac{3\sqrt{3}+3-3-\sqrt{3}}{6}\times\sqrt{3}=\frac{2\sqrt{3}\times\sqrt{3}}{6}=1$$

Alternate Method:

$$\frac{\sin\theta+\cos\theta-1}{\sin\theta-\cos\theta+1}\times\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$$

With the help of triplet

$$\begin{matrix}(3, & 4, & 5)\\ \downarrow & \downarrow & \downarrow\\ P & B & H\end{matrix}$$

$$\left(\frac{\frac{3}{5}+\frac{4}{5}-1}{\frac{3}{5}-\frac{4}{5}+1}\right)\times\sqrt{\frac{1+\frac{3}{5}}{1-\frac{3}{5}}}=\frac{2}{5}\times\frac{5}{4}\times2=1$$

411. (d) $\sqrt{\frac{\operatorname{cosec}A+1}{\operatorname{cosec}A-1}}+\sqrt{\frac{\operatorname{cosec}A-1}{\operatorname{cosec}A+1}}$

By rationalizing

$= \frac{\operatorname{cosec}A+1}{\cot A}+\frac{\operatorname{cosec}A-1}{\cot A}$

$= \frac{\operatorname{cosec}A+1+\operatorname{cosec}A-1}{\cot A}=\frac{2\operatorname{cosec}A}{\cot A}$

$= 2\times\frac{1}{\sin A}\times\frac{\sin A}{\cos A} = 2\sec A$

Alternate Method:

$\sqrt{\frac{\operatorname{cosec}A+1}{\operatorname{cosec}A-1}}+\sqrt{\frac{\operatorname{cosec}A-1}{\operatorname{cosec}A+1}}$

Put A = 45°

$\sqrt{\frac{\sqrt{2}+1}{\sqrt{2}-1}}+\sqrt{\frac{\sqrt{2}-1}{\sqrt{2}+1}}$

$= \sqrt{2}+1+\sqrt{2}-1 = 2\sqrt{2}$

Option (d), $2\sec A = 2\sqrt{2}$

412. (d) $\sqrt{\frac{1+\cos p}{1-\cos p}}$

$= \sqrt{\frac{(1+\cos p)\times(1+\cos p)}{(1-\cos p)\times(1+\cos p)}}$

$= \sqrt{\frac{(1+\cos p)^2}{1-\cos^2 p}} = \sqrt{\frac{(1+\cos p)^2}{\sin^2 p}}$

$= \frac{1+\cos p}{\sin p} = \frac{1}{\sin p}+\frac{\cos p}{\sin p}$

= cosecp + cotp

413. (a) $\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$

$= \sqrt{\frac{1-\cos^2 A}{(1+\cos A)^2}}+\sqrt{\frac{(1+\cos A)^2}{1-\cos^2 A}}$

$= \frac{\sin A}{1+\cos A}+\frac{1+\cos A}{\sin A}$

$= \frac{\sin^2 A+1+\cos^2 A+2\cos A}{\sin A(1+\cos A)}$

$= \frac{2(1+\cos A)}{\sin A(1+\cos A)} = 2\operatorname{cosec}A$

Alternate Method:

Put A = 60°

$\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$

$= \sqrt{\frac{1-\frac{1}{2}}{1+\frac{1}{2}}}+\sqrt{\frac{1+\frac{1}{2}}{1-\frac{1}{2}}}$

$= \sqrt{\frac{1}{2}\times\frac{2}{3}}+\sqrt{\frac{3}{2}\times 2}$

$= \frac{1}{\sqrt{3}}+\sqrt{3} = \frac{4}{\sqrt{3}}$

∴ 2 cosecA = 2 × cosec60°

$= 2\times\frac{2}{\sqrt{3}} = \frac{4}{\sqrt{3}}$

414. (b) $\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}+\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}$

Rationalising denominator,

$\frac{\sec\theta+1}{\tan\theta}+\frac{\sec\theta-1}{\tan\theta}=\frac{2\sec\theta}{\tan\theta}$

$= \frac{\frac{2}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}} = 2\operatorname{cosec}\theta$

Alternate Method:

Put, θ = 60°

$\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}+\sqrt{\frac{\sec\theta-1}{\sec\theta+1}} = \sqrt{\frac{2+1}{2-1}}+\sqrt{\frac{2-1}{2+1}}$

$= \sqrt{3}+\frac{1}{\sqrt{3}} = \frac{4}{\sqrt{3}}$

By options,

$2\operatorname{cosec}\theta = 2\operatorname{cosec}60° = 2\times\frac{2}{\sqrt{3}} = \frac{4}{\sqrt{3}}$

415. (b) Given

$\left\{\left(\frac{\sec\theta-1}{\sec\theta+1}\right)^n\right\} = (\operatorname{cosec}\theta-\cot\theta)$

R.H.S = cosecθ − cotθ

$= \frac{1}{\sin\theta}-\frac{\cos\theta}{\sin\theta}$

$= \frac{1-\cos\theta}{\sin\theta}$ ..... (i)

$= \frac{1-\cos\theta}{\sin\theta}\times\frac{1+\cos\theta}{1+\cos\theta}$

$= \frac{1-\cos^2\theta}{\sin\theta(1+\cos\theta)} = \frac{\sin^2\theta}{\sin\theta(1+\cos\theta)}$

$= \frac{\sin\theta}{1+\cos\theta}$ ..... (ii)

Multiplying (i) and (ii), we get–

$\frac{1-\cos\theta}{1+\cos\theta} = (\operatorname{cosec}\theta-\cot\theta)^2$

$\frac{\sec\theta-1}{\sec\theta+1} = (\operatorname{cosec}\theta-\cot\theta)^2$

$\Rightarrow \left(\frac{\sec\theta-1}{\sec\theta+1}\right)^{\frac{1}{2}} = \operatorname{cosec}\theta-\cot\theta$

Hence, $n = \frac{1}{2} = 0.5$

Alternate Method:

Put θ = 45°

$\left\{\left(\frac{\sec\theta-1}{\sec\theta+1}\right)\right\}^n = \operatorname{cosec}\theta-\cot\theta$

$\left(\frac{\sqrt{2}-1}{\sqrt{2}+1}\right)^n = (\sqrt{2}-1)$

By rationalizing we get

$\Rightarrow [(\sqrt{2}-1)(\sqrt{2}-1)]^n = (\sqrt{2}-1)$

$\Rightarrow [(\sqrt{2}-1)^2]^n = (\sqrt{2}-1)$

⇒ 2n = 1

$\Rightarrow n = \frac{1}{2} = 0.5$

416. (d) $\sqrt{\frac{1-\tan A}{1+\tan A}}$

$= \sqrt{\frac{1-\frac{\sin A}{\cos A}}{1+\frac{\sin A}{\cos A}}} = \sqrt{\frac{\cos A-\sin A}{\cos A+\sin A}}$

$= \sqrt{\frac{\cos^2 A+\sin^2 A-2\sin A\cos A}{\cos^2 A-\sin^2 A}}$

$= \sqrt{\frac{1-2\sin A\cos A}{\cos^2 A-\sin^2 A}} = \sqrt{\frac{1-\sin 2A}{\cos 2A}}$

417. (c) $\left[\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}\right]$

[∴ sec²θ − tan²θ = 1]

$= \frac{[\tan\theta+\sec\theta-(\sec^2\theta-\tan^2\theta)]}{(\tan\theta-\sec\theta+1)}$

$= (\tan\theta+\sec\theta)\left[\frac{1-\sec\theta+\tan\theta}{\tan\theta-\sec\theta+1}\right]$

$= \tan\theta+\sec\theta = \frac{1+\sin\theta}{\cos\theta}$

Alternate Method:

Put θ = 60°

$\frac{\tan 60°+\sec 60°-1}{\tan 60°-\sec 60°+1} = \frac{\sqrt{3}+2-1}{\sqrt{3}-2+1}$

$= \frac{\sqrt{3}+1}{\sqrt{3}-1}$

By rationalizing we get

$= \frac{(\sqrt{3}+1)^2}{2} = \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$

Go through options,

$\frac{1+\sin 60°}{\cos 60°} = \frac{1+\frac{\sqrt{3}}{2}}{\frac{1}{2}} = 2+\sqrt{3}$

418. (d) $\frac{\tan\theta-\sec\theta+1}{\tan\theta+\sec\theta-1}$

Put θ = 45°

$\Rightarrow \frac{1-\sqrt{2}+1}{1+\sqrt{2}-1} = \frac{\sqrt{2}(\sqrt{2}-1)}{\sqrt{2}}$

$= (\sqrt{2}-1)$

By option,

$\frac{\cos\theta}{1+\sin\theta} = \frac{\frac{1}{\sqrt{2}}}{1+\frac{1}{\sqrt{2}}} = \frac{1}{\sqrt{2}+1} = (\sqrt{2}-1)$

Alternate Method:

$\frac{\tan\theta-\sec\theta+1}{\tan\theta+\sec\theta-1}$

$= \frac{\tan\theta-\sec\theta+(\sec^2\theta-\tan^2\theta)}{\tan\theta+\sec\theta-1}$

$= \frac{(\sec\theta-\tan\theta)[-1+\sec\theta+\tan\theta]}{(\tan\theta+\sec\theta-1)}$

$= \sec\theta-\tan\theta = \frac{1}{\cos\theta}-\frac{\sin\theta}{\cos\theta}$

$= \frac{1-\sin\theta}{\cos\theta} = \frac{\cos\theta}{1+\sin\theta}$

419. (d) $\frac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}+1}$

put triplet = (3, 4, 5)

$$\Rightarrow \frac{\frac{4}{3}+\frac{5}{3}-\frac{1}{1}}{\frac{4}{3}-\frac{5}{3}+\frac{1}{1}}=\frac{\frac{6}{3}}{\frac{2}{3}}=3$$

option (d), $(\operatorname{cosec}\theta+\cot\theta)$

$$=\frac{5}{3}+\frac{4}{3}=\frac{9}{3}=3$$

Alternate Method:

$$\frac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}\theta+1}$$

Put $\theta = 45°$

$$\Rightarrow \frac{1+\sqrt{2}-1}{1-\sqrt{2}+1}=\frac{\sqrt{2}}{2-\sqrt{2}}=\frac{\sqrt{2}(2+\sqrt{2})}{4-2}$$

$$=\frac{2+\sqrt{2}}{\sqrt{2}}=\sqrt{2}+1$$

Go through options,

$\operatorname{cosec}\theta+\cot\theta=\operatorname{cosec}45°+\cot45°$

$$=\sqrt{2}+1$$

420. (a) $\frac{\sin A}{1+\cos A}\times\frac{1-\cos A}{1-\cos A}$

$$=\frac{\sin(1-\cos A)}{\sin^2 A}=\frac{1-\cos A}{\sin A}$$

421. (a) $p=\frac{\sin A}{1+\cos A}$

$$\Rightarrow p=\frac{\sin A}{1+\cos A}\times\frac{1-\cos A}{1-\cos A}$$

$$\Rightarrow p=\frac{\sin A(1-\cos A)}{(1-\cos^2 A)}=\frac{\sin A(1-\cos A)}{\sin^2 A}$$

$$\Rightarrow p=\frac{1-\cos A}{\sin A}\Rightarrow\frac{1}{p}=\frac{\sin A}{1-\cos A}$$

422.(d) $\frac{\sin A}{1+\cos A}+\cot A$

Let, $\theta = 30°$

$$\Rightarrow \frac{\frac{1}{2}}{1+\frac{\sqrt{3}}{2}}+\sqrt{3}=\frac{1}{2+\sqrt{3}}+\sqrt{3}$$

$$=\frac{1+2\sqrt{3}+3}{2+\sqrt{3}}=\frac{4+2\sqrt{3}}{2+\sqrt{3}}$$

$$=\frac{2\left(2+\sqrt{3}\right)}{2+\sqrt{3}}=2$$

From options (d) cosec30° = 2

Alternate Method:-

$$\frac{\sin A}{1+\cos A}+\frac{\cos A}{\sin A}$$

$$=\frac{\sin^2 A+\cos A+\cos^2 A}{\sin A(1+\cos A)}$$

$$=\frac{1+\cos A}{\sin A(1+\cos A)}$$

$$=\frac{1}{\sin A}=\operatorname{cosec}A.$$

423. (d) $\frac{1+\sin\theta-\cos\theta}{1+\sin\theta+\cos\theta}$

Put $\theta = 60°$

$$\frac{1+\sin60°-\cos60°}{1+\sin60°+\cos60°}$$

$$=\frac{1+\frac{\sqrt{3}}{2}-\frac{1}{2}}{1+\frac{\sqrt{3}}{2}+\frac{1}{2}}=\frac{\frac{2+\sqrt{3}-1}{2}}{\frac{3+\sqrt{3}}{2}}$$

$$=\frac{1+\sqrt{3}}{\sqrt{3}(1+\sqrt{3})}=\frac{1}{\sqrt{3}}$$

Now put the value of $\theta = 60°$ in option (d)

$$\therefore \tan\frac{\theta}{2}=\tan30°=\frac{1}{\sqrt{3}}\text{ (satisfied)}$$

424. (c) $\frac{\sin\theta+\cos\theta-1}{\sin\theta-\cos\theta+1}\times\frac{\tan^2\theta(\operatorname{cosec}^2\theta-1)}{\sec\theta-\tan\theta}$

Put, $\theta = 45°$

$$\frac{\sin45°+\cos45°-1}{\sin45°-\cos45°+1}\times\frac{\tan^2 45°(\operatorname{cosec}^2 45°-1)}{\sec45°-\tan45°}$$

$$=\frac{\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{2}}-1}{1}\times\frac{1((\sqrt{2})^2-1)}{\sqrt{2}-1}$$

$$=\sqrt{2}-1\times\frac{1}{\sqrt{2}-1}=1$$

425. (d) $\frac{1+\sin\theta}{\cos\theta}$

By rationalizing we get,

$$\Rightarrow \frac{1+\sin\theta}{\cos\theta}\times\frac{(\cos\theta)}{(\cos\theta)}=\frac{\cos\theta}{1-\sin\theta}$$

Alternate Method:

Put $\theta = 30°$

$$\frac{1+\sin30°}{\cos30°}=\frac{1+\frac{1}{2}}{\frac{\sqrt{3}}{2}}=\frac{3}{\sqrt{3}}=\sqrt{3}$$

Go through options,

$$\frac{\cos30°}{1-\sin30°}=\frac{\frac{\sqrt{3}}{2}}{1-\frac{1}{2}}=\sqrt{3}$$

426. (a) $(1+\cot A-\operatorname{cosec}A)(1+\tan A+\sec A)-3(\sin^2 A+\cos^2 A)$

Put $A = 45°$

$\Rightarrow (1+1-\sqrt{2})(1+1+\sqrt{2})-3$

$=(2-\sqrt{2})(2+\sqrt{2})-3$

$=(2)^2-(\sqrt{2})^2-3$

$=4-2-3=-1$

427. (a) $(\tan\theta+\sec\theta+1)(\cot\theta-\operatorname{cosec}\theta+1)$

$$=\left(\frac{\sin\theta}{\cos\theta}+\frac{1}{\cos\theta}+\frac{1}{1}\right)\left(\frac{\cos\theta}{\sin\theta}-\frac{1}{\sin\theta}+\frac{1}{1}\right)$$

$$=\left(\frac{\sin\theta+1+\cos\theta}{\cos\theta}\right)\left(\frac{\cos\theta-1+\sin\theta}{\sin\theta}\right)$$

$$=\frac{(\sin\theta+\cos\theta)^2-(1)^2}{\sin\theta\times\cos\theta}\quad\therefore\left[(a+b)(a-b)=a^2-b^2\right]$$

$$=\frac{\sin^2\theta+\cos^2\theta+2\sin\theta\cos\theta-1}{\sin\theta\times\cos\theta}$$

$$=\frac{1+2\sin\theta\cos\theta-1}{\sin\theta.\cos\theta}\quad\therefore\left[\sin^2\theta+\cos^2\theta=1\right]$$

$=2$

Alternate Method:

Put $\theta = 45°$

$(\tan45°+\sec45°+1)(\cot45°-\operatorname{cosec}45°+1)$

$=(1+\sqrt{2}+1)(1-\sqrt{2}+1)$

$=(2+\sqrt{2})(2-\sqrt{2})$

$\therefore [a^2-b^2=(a+b)(a-b)]$

$=4-2=2$

428. (d) $(1+\tan\theta-\sec\theta)(1+\cot\theta+\operatorname{cosec}\theta)$

$$=\left(1+\frac{\sin\theta}{\cos\theta}-\frac{1}{\cos\theta}\right)\left(1+\frac{\cos\theta}{\sin\theta}+\frac{1}{\sin\theta}\right)$$

$$=\left(\frac{\cos\theta+\sin\theta-1}{\cos\theta}\right)\left(\frac{\sin\theta+\cos\theta+1}{\sin\theta}\right)$$

$$=\frac{1+2\sin\theta\cos\theta-1}{\cos\theta\sin\theta}=2$$

Alternate Method:

$(1+\tan\theta-\sec\theta)(1+\cot\theta+\operatorname{cosec}\theta)$

Put $\theta = 45°$

$\Rightarrow (1+1-\sqrt{2})(1+1+\sqrt{2})$

$=(2-\sqrt{2})(2+\sqrt{2})=4-2=2$

429. (a) $(1+\cot A-\operatorname{cosec}A)(1+\tan A+\sec A)-1$

$$=\left(1+\frac{\cos A}{\sin A}-\frac{1}{\sin A}\right)\left(1+\frac{\sin A}{\cos A}+\frac{1}{\cos A}\right)-1$$

$$=\left\{\frac{(\sin A+\cos A)^2-1^2}{\sin A.\cos A}\right\}-1$$

$$=\left\{\frac{\sin^2 A+\cos^2 A+2\sin A\cos A-1}{\sin A.\cos A}\right\}-1$$

$[\sin^2 A+\cos^2 A=1]$

$$=\left\{\frac{1+2\sin A\cos A-1}{\sin A.\cos A}\right\}-1$$

$$=\left\{\frac{2\sin A\cos A}{\sin A.\cos A}\right\}-1$$

$=2-1=1$

Alternate Method:

Put $A = 45°$

$(1+\cot45°-\operatorname{cosec}45°)(1+\tan45°+\sec45°)-1$

$=(1+1-\sqrt{2})(1+1+\sqrt{2})-1$

$=(2-\sqrt{2})(2+\sqrt{2})-1$

$=2-1=1$

430. (b) $(\operatorname{cosec}A+\cot A+1)(\operatorname{cosec}A-\cot A+1)-2\operatorname{cosec}A$

$=(\operatorname{cosec}A+\cot A+1)(\operatorname{cosec}A+1-\cot A)-2\operatorname{cosec}A$

$=(\operatorname{cosec}A+1)^2-\cot^2 A-2\operatorname{cosec}A$

$=\operatorname{cosec}^2 A+1+2\operatorname{cosec}A-\cot^2 A-2\operatorname{cosec}A$

$=\operatorname{cosec}^2 A-\cot^2 A+1$

$=1+1=2$

Alternate Method:

Put $\theta = 45°$

$(\operatorname{cosec}45°+\cot45°+1)(\operatorname{cosec}45°-\cot45°+1)-2\operatorname{cosec}45°$

$=(\sqrt{2}+2)(\sqrt{2}-1+1)-2\sqrt{2}$

$=(\sqrt{2}+2)\times\sqrt{2}-2\sqrt{2}$

$=2+2\sqrt{2}-2\sqrt{2}=2$

431. (c) $(1 + \cot A + \tan A)(\sin A - \cos A)\left(\frac{\sin A\cos A}{\sin^3A - \cos^3A}\right)$

$= \left(1+\frac{\cos A}{\sin A}+\frac{\sin A}{\cos A}\right)(\sin A - \cos A)$

$\times\left(\frac{\sin A\cos A}{(\sin A-\cos A)(\sin^2A+\cos^2A+\sin A\cos A)}\right)$

$= (\cos A\sin A + \cos^2A + \sin^2A)(\sin A - \cos A) \times \frac{1}{(\sin A-\cos A)(1+\sin A\cos A)}$

$= \frac{(1+\cos A\sin A)}{1+\sin A\cos A} = 1$

432. (c) We know,

$2\sin^2A = 1 - \cos 2A$

$2\cos^2A = 1 + \cos 2A$

On solving option (c) we get

$= \frac{\sqrt{1-\cos A}}{\sqrt{1+\cos A}} = \frac{\sqrt{2\sin^2\frac{A}{2}}}{\sqrt{2\cos^2\frac{A}{2}}} = \tan\frac{A}{2}$

433. (a) $\sqrt{\frac{1-\sin 3\theta}{1+\sin 3\theta}}$

By rationalization

$= \sqrt{\frac{(1-\sin 3\theta)^2}{1-\sin^2 3\theta}} = \frac{1-\sin 3\theta}{\cos 3\theta}$

$= \sec 3\theta - \tan 3\theta$

Alternate Method:

$\frac{\sqrt{1-\sin 3\theta}}{\sqrt{1+\sin 3\theta}}$

Put $\theta = 10°$, $\frac{\sqrt{1-\sin 30°}}{\sqrt{1+\sin 30°}} = \frac{\sqrt{\frac{1}{2}}}{\sqrt{\frac{3}{2}}} = \frac{1}{\sqrt{3}}$

Using option (a), $\sec 3\theta - \tan 3\theta$

$= \sec 30° - \tan 30°$

$= \frac{2}{\sqrt{3}} - \frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}}$ (Satisfied)

434. (d) $\tan\frac{\theta}{2} = \sqrt{\frac{2\sin^2\frac{A}{2}}{2\cos^2\frac{A}{2}}} = \sqrt{\frac{1-\cos A}{1+\cos A}}$

$= \frac{\sin\theta}{1+\cos\theta}$

Alternate Method:

Put $\theta = 60°$, $\tan\frac{60°}{2} = \tan 30° = \frac{1}{\sqrt{3}}$

Go through option

(d) $\frac{\sin\theta}{1+\cos\theta} = \frac{\sin 60°}{1+\cos 60°}$

$= \frac{\frac{\sqrt{3}}{2}}{1+\frac{1}{2}} = \frac{\frac{\sqrt{3}}{2}}{\frac{3}{2}} = \frac{1}{\sqrt{3}}$

435. (c) $\frac{\tan A - \sin A}{\tan A + \sin A}$

$\therefore \tan A = \frac{\sin A}{\cos A} = \sin A\sec A$

$= \frac{\sin A\sec A - \sin A}{\sin A\sec A + \sin A}$

$= \frac{\sin A(\sec A - 1)}{\sin A(\sec A + 1)} = \frac{(\sec A - 1)}{(\sec A + 1)}$

436. (a) $\frac{1-\cos\theta}{\sin\theta} = \frac{1}{5}$

$\Rightarrow \frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta} = \frac{1}{5}$

$\Rightarrow \operatorname{cosec}\theta - \cot\theta = \frac{1}{5}$

$\therefore \frac{1+\cos\theta}{\sin\theta} = \operatorname{cosec}\theta + \cot\theta = 5$

Alternate Method:

$\frac{1-\cos\theta}{\sin\theta} = \frac{1}{5}$

$\frac{1-\cos\theta}{\sin\theta} \times \frac{\sin\theta}{\sin\theta} = \frac{1}{5}$

$\frac{\sin\theta}{1+\cos\theta} = \frac{1}{5}$

$\frac{1+\cos\theta}{\sin\theta} = \frac{5}{1}$

437. (b) $\frac{\cos A}{1+\tan A} - \frac{\sin A}{1+\cot A}$

$= \frac{\cos A}{1+\frac{\sin A}{\cos A}} - \frac{\sin A}{1+\frac{\cos A}{\sin A}}$

$= \frac{\cos^2A}{\cos A+\sin A} - \frac{\sin^2A}{\sin A+\cos A}$

$= \frac{\cos^2A-\sin^2A}{\cos A+\sin A} = \cos A - \sin A$

Alternate Method:

$\frac{\cos A}{1+\tan A} - \frac{\sin A}{1+\cot A}$

Put $\theta = 45°$,

$\Rightarrow \frac{\cos 45°}{1+\tan 45°} - \frac{\sin 45°}{1+\cot 45°} = 0$

Go through options,

$\cos A - \sin A = \cos 45° - \sin 45°$

$= \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} = 0$

438. (d) $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A}$

$= \frac{\cos^2A}{\cos A-\sin A} + \frac{\sin^2A}{\sin A-\cos A}$

$= \frac{\cos^2A-\sin^2A}{\cos A-\sin A}$

$= \cos A + \sin A$

439. (c) $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} - \sin A$

$= \frac{\cos A}{1-\frac{\sin A}{\cos A}} + \frac{\sin A}{1-\frac{\cos A}{\sin A}} - \sin A$

$= \frac{\cos^2A}{\cos A-\sin A} + \frac{\sin^2A}{\sin A-\cos A} - \sin A$

$= \frac{\cos^2A}{\cos A-\sin A} - \frac{\sin^2A}{\cos A-\sin A} - \sin A$

$= \frac{\cos^2A-\sin^2A}{\cos A-\sin A} - \sin A$

$= \cos A + \sin A - \sin A = \cos A$

Alternate Method:-

$\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} - \sin A$

3 4 5

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$\Rightarrow \frac{\frac{4}{5}}{1-\frac{3}{4}} + \frac{\frac{3}{5}}{1-\frac{4}{3}} - \frac{3}{5} \Rightarrow \frac{16}{5} - \frac{9}{5} - \frac{3}{5} = \frac{4}{5}$

Go through option

$\cos A = \frac{4}{5}$

440. (b) $1 + \sin\theta = m\cos\theta$

$\Rightarrow m = \frac{1+\sin\theta}{\cos\theta} = \sqrt{\frac{(1+\sin\theta)^2}{1-\sin^2\theta}}$

$= \sqrt{\frac{(1+\sin\theta)(1+\sin\theta)}{(1-\sin\theta)(1+\sin\theta)}} = \sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$

$\Rightarrow \frac{m^2}{1} = \frac{1+\sin\theta}{1-\sin\theta}$

Using Componendo and dividendo,

$\frac{m^2+1}{m^2-1} = \frac{1}{\sin\theta} \Rightarrow \sin\theta = \frac{m^2-1}{m^2+1}$

Alternate Method:

$1 + \sin\theta = m\cos\theta$

Put $\theta = 45°$

$\Rightarrow 1 + \frac{1}{\sqrt{2}} = \frac{m}{\sqrt{2}} \Rightarrow \sqrt{2} + 1 = m$

Go through Options,

$\frac{m^2-1}{m^2+1} = \frac{(\sqrt{2}+1)^2-1}{(\sqrt{2}+1)^2+1} = \frac{3+2\sqrt{2}-1}{3+2\sqrt{2}+1}$

$= \frac{2+2\sqrt{2}}{4+2\sqrt{2}} = \frac{1}{\sqrt{2}}$

441. (d) $1+\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}}$, $0° < \theta < 90°$

$= 1+\sqrt{\frac{\frac{\cos\theta}{\sin\theta}+\cos\theta}{\frac{\cos\theta}{\sin\theta}-\cos\theta}}$

$= 1+\sqrt{\frac{\frac{\cos\theta}{\sin\theta}(1+\sin\theta)}{\frac{\cos\theta}{\sin\theta}(1-\sin\theta)}} = 1+\frac{\sqrt{1+\sin\theta}}{\sqrt{1-\sin\theta}}$

Rationalise, we get

$= 1+\frac{\sqrt{1+\sin\theta}}{\sqrt{1-\sin\theta}} \times \frac{\sqrt{1+\sin\theta}}{\sqrt{1+\sin\theta}}$

$= 1+\frac{\sqrt{(1+\sin\theta)^2}}{\sqrt{(1-\sin^2\theta)}}$

$= 1+\frac{1+\sin\theta}{\cos\theta} = 1+\frac{1}{\cos\theta}+\frac{\sin\theta}{\cos\theta}$

$= 1+\sec\theta+\tan\theta$

Alternate Method:

Put $\theta = 45°$,

$1+\sqrt{\frac{\cot 45°+\cos 45°}{\cot 45°-\cos 45°}}$

$= 1+\sqrt{\frac{1+\frac{1}{\sqrt{2}}}{1-\frac{1}{\sqrt{2}}}} = 1+\sqrt{\frac{\sqrt{2}+1}{\sqrt{2}-1}}$

$= 1 + \sqrt{2} + 1 = 2 + \sqrt{2}$

Go through options,

$1 + \sec\theta + \tan\theta = 1 + \sec 45° + \tan 45°$

$= 1 + \sqrt{2} + 1 = 2 + \sqrt{2}$

442.(c) $2-\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}}$

$= 2-\sqrt{\frac{\cos\theta(1+\sin\theta)}{\cos\theta(1-\sin\theta)}}$

$= 2-\sqrt{\left[\frac{1+\sin\theta}{\cos\theta}\right]^2}$

$= 2 - \sec\theta - \tan\theta$

Alternate Method:

Put $\theta = 45°$,

$2-\sqrt{\frac{\cot 45°+\cos 45°}{\cot 45°-\cos 45°}}$

$= 2-\sqrt{\frac{1+\frac{1}{\sqrt{2}}}{1-\frac{1}{\sqrt{2}}}} = 2-\sqrt{\frac{\sqrt{2}+1}{\sqrt{2}-1}} = 2-(\sqrt{2}+1)$

$= 2-\sqrt{2}-1 \;= 1-\sqrt{2}$

Go through options,

$2 - \sec\theta - \tan\theta = 2-\sqrt{2}-1 = 1-\sqrt{2}$

443.(d) $1 + 2\tan^2\theta + 2\sin\theta\sec^2\theta$

$= 1+\frac{2\sin^2\theta}{\cos^2\theta}+\frac{2\sin\theta}{\cos^2\theta}$

$= \frac{\cos^2\theta+2\sin^2\theta+2\sin\theta}{\cos^2\theta}$

$= \frac{1+\sin^2\theta+2\sin\theta}{\cos^2\theta}$

$= \frac{(\sin\theta+1)^2}{(1-\sin^2\theta)} = \frac{1+\sin\theta}{1-\sin\theta}$

Alternate Method:-

$1 + 2\tan^2\theta + 2\sin\theta\sec^2\theta$

Put $\theta = 30°$,

$1+\frac{2}{3}+\frac{2}{2}\times\frac{4}{3} = \frac{9}{3} = 3$

from given options

$\frac{1+\sin 30°}{1-\sin 30°} = \frac{1+\frac{1}{2}}{1-\frac{1}{2}} = \frac{3/2}{1/2} = 3$

444. (c) $1+ 2\tan^2\theta + 2\sin\theta\sec^2\theta = \frac{a}{b}$

$\Rightarrow 1 + 2\,\frac{\sin^2\theta}{\cos^2\theta}+\frac{2\sin\theta}{\cos^2\theta} = \frac{a}{b}$

$\Rightarrow \frac{\cos^2\theta+2\sin^2\theta+2\sin\theta}{\cos^2\theta} = \frac{a}{b}$

$\Rightarrow \frac{\cos^2\theta+\sin^2\theta+\sin^2\theta+2\sin\theta}{\cos^2\theta} = \frac{a}{b}$

$\Rightarrow \frac{1+\sin^2\theta+2\sin\theta}{\cos^2\theta} = \frac{a}{b}$

$\Rightarrow \frac{(1+\sin\theta)^2}{1-\sin^2\theta} = \frac{a}{b} \Rightarrow \frac{1+\mathrm{Sin}\,\theta}{1-\mathrm{Sin}\,\theta} = \frac{a}{b}$

$\therefore \frac{a+b}{a-b} = \frac{1}{\sin\theta} = \mathrm{cosec}\,\theta$

Alternate Method:-

Put $\theta = 60°$

$1 + 2\tan^2 60° + 2\sin 60°\sec^2 60° = \frac{a}{b}$

$\Rightarrow 1 + 6 + 2 \times \frac{\sqrt{3}}{2} \times 4 = \frac{a}{b}$

$\Rightarrow \frac{7+4\sqrt{3}}{1} = \frac{a}{b}$

$\frac{a+b}{a-b} = \frac{7+4\sqrt{3}+1}{7+4\sqrt{3}-1} = \frac{8+4\sqrt{3}}{6+4\sqrt{3}} = \frac{4(2+\sqrt{3})}{2\sqrt{3}(\sqrt{3}+2)}$

$= \frac{2}{\sqrt{3}} = \mathrm{cosec}60°$

445. (d) $\left(\frac{1+\sec^2 A}{1+\cos^2 A}\right)\left(\frac{1+\sin^2 A}{1+\mathrm{cosec}^2 A}\right)$

$= \left(\frac{1+\sec^2 A}{1+\frac{1}{\sec^2 A}}\right)\times\left(\frac{1+\sin^2 A}{1+\frac{1}{\sin^2 A}}\right)$

$= \left[\frac{(1+\sec^2 A)}{(\sec^2 A+1)}\times\sec^2 A\right]$

$\times\left[\frac{(1+\sin^2 A)}{(\sin^2 A+1)}\times\sin^2 A\right]$

$= \sin^2 A\sec^2 A = \tan^2 A$

Alternate Method:

Put $\theta = 45°$,

$\left(\frac{1+\sec^2 45°}{1+\cos^2 45°}\right)\left(\frac{1+\sin^2 45°}{1+\mathrm{cosec}^2 45°}\right)$

$= \left(\frac{1+2}{1+\frac{1}{2}}\right)\left(\frac{1+\frac{1}{2}}{1+2}\right) = \left(\frac{3\times 2}{3}\right)\left(\frac{3}{2\times 3}\right) = 1$

Go through options,

$\tan^2\theta = \tan^2 45° = 1$

446.(c) $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}+\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}$

We know,

$\frac{a+b}{a-b}+\frac{a-b}{a+b} = \frac{2(a^2+b^2)}{a^2-b^2}$

$\Rightarrow \frac{2(\sin^2\theta+\cos^2\theta)}{\sin^2\theta-\cos^2\theta} = \frac{2}{\sin^2\theta-\cos^2\theta}$

447.(a) $(2\cos^2\theta-1)\left[\frac{1+\tan\theta}{1-\tan\theta}+\frac{1-\tan\theta}{1+\tan\theta}\right]$

We know,

$\frac{a+b}{a-b}+\frac{a-b}{a+b} = \frac{2(a^2+b^2)}{a^2-b^2}$

$= (2\cos^2\theta - 1)\left[\frac{2(1+\tan^2\theta)}{(1-\tan^2\theta)}\right]$

$= \cos 2\theta \times 2 \times \frac{1}{\cos 2\theta} = 2$

$\left[\begin{array}{l} 2\cos^2\theta-1 = \cos 2\theta \\ \frac{1-\tan^2\theta}{1+\tan^2\theta} = \cos 2\theta \end{array}\right]$

Alternate Method:

$(2\cos^2\theta - 1)\left[\frac{1+\tan\theta}{1-\tan\theta}+\frac{1-\tan\theta}{1+\tan\theta}\right]$

Put $\theta = 30°$

$\left(2\times\frac{3}{4}-1\right)\left\{\frac{1+\frac{1}{\sqrt{3}}}{1-\frac{1}{\sqrt{3}}}+\frac{1-\frac{1}{\sqrt{3}}}{1+\frac{1}{\sqrt{3}}}\right\}$

$= \left(\frac{3}{2}-1\right)\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}+\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$

$= \frac{1}{2}\times\left(\frac{(\sqrt{3}+1)^2+(\sqrt{3}-1)^2}{2}\right)$

$= \frac{4+2\sqrt{3}+4-2\sqrt{3}}{4} = 2$

448. (b) $\frac{1+\tan A}{\mathrm{cosec}A}+\frac{1+\cot A}{\sec A}$

$= \frac{1+\frac{\sin A}{\cos A}}{\frac{1}{\sin A}}+\frac{1+\frac{\cos A}{\sin A}}{\frac{1}{\cos A}}$

$= \frac{\cos A+\sin A}{\cos A}\times\sin A+\frac{\sin A+\cos A}{\sin A}\times\cos A$

$= (\cos A+\sin A)\left(\frac{\sin A}{\cos A}+\frac{\cos A}{\sin A}\right)$

$= \frac{\cos A+\sin A}{\sin A\,\cos A} = \frac{1}{\sin A}+\frac{1}{\cos A}$

$= \mathrm{cosec}A + \sec A$

Alternate Method:

$\frac{1+\tan A}{\mathrm{cosec}A}+\frac{1+\cot A}{\sec A}$

Put $A = 45°$

$\Rightarrow \frac{1+1}{\sqrt{2}}+\frac{1+1}{\sqrt{2}} \Rightarrow \frac{2}{\sqrt{2}}+\frac{2}{\sqrt{2}} = \frac{4}{\sqrt{2}} = 2\sqrt{2}$

$(\sec A + \mathrm{cosec}A) = 2\sqrt{2}$

Hence, Option (b) satisfied

449.(c) $\mathrm{cosec}^4 A\ (1 - \cos^4 A) - 2\cot^2 A - 1$

$= \frac{\mathrm{cosec}^2 A}{\sin^2 A}\ (1 - \cos^2 A)\ (1 + \cos^2 A) - 2\cot^2 A - 1$

$= \mathrm{cosec}^2 A\ (1 + \cos^2 A) - 2\cot^2 A - 1$

$= \mathrm{cosec}^2 A + \cot^2 A - 2\cot^2 A - 1$

$= \mathrm{cosec}^2 A - \cot^2 A - 1$

$= 1 - 1 = 0$

Alternate Method:-

Put $A = 45°$

$\mathrm{cosec}^4 45°(1 - \cos^4 45°) - 2\cot^2 45° - 1$

$= 4\left(1-\frac{1}{4}\right) - 2 - 1$

$= 4 \times \frac{3}{4} - 3 = 3 - 3 = 0$

SMART APPROACH:-

$\mathrm{cosec}^4 A\ (1 - \cos^4 A) - 2\cot^2 A - 1$

$= \mathrm{cosec}^4 A - \cot^4 A - 2\cot^2 A - 1$

$= \mathrm{cosec}^2 A + \cot^2 A - 2\cot^2 A - 1$

$= \mathrm{cosec}^2 A - \cot^2 A - 1$

$= 1 - 1 = 0$

450. (b) $\sin\theta - \cos\theta = \frac{1}{5}$

$\therefore \sin\theta + \cos\theta$

$= \sqrt{2-\left(\frac{1}{5}\right)^2} = \sqrt{2-\frac{1}{25}} = \sqrt{\frac{49}{25}} = \frac{7}{5}$

451. (c) If, $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

Comparing with $a\cos\theta - b\sin\theta = c$

$a = 1,\ b = 1,\ c = \sqrt{2}\sin\theta$

$\cos\theta + \sin\theta = \sqrt{a^2+b^2-c^2}$

$= \sqrt{1+1-2\sin^2\theta} = \sqrt{2}\cos\theta$

452.(c) $4\cos\theta + 3\sin\theta = x$

squaring both sides–

$16\cos^2\theta + 9\sin^2\theta + 24\sin\theta\cos\theta = x^2$ ……(i)

Again,

$4\sin\theta - 3\cos\theta = y$

squaring both sides–

$16\sin^2\theta + 9\cos^2\theta - 24\sin\theta\cos\theta = y^2$ ……(ii)

Adding equation (i) and (ii), we get–

$x^2 + y^2 = 25\sin^2\theta + 25\cos^2\theta$

$= 25(\sin^2\theta + \cos^2\theta) = 25(1) = 25$

SMART APPROACH:-

Special Case:

If $A\cos\theta + B\sin\theta = x$

and $A\sin\theta - B\cos\theta = y$

then -

$x^2 + y^2 = A^2 + B^2$

Given,

$4\cos\theta + 3\sin\theta = x$

$4\sin\theta - 3\sin\theta = y$

$\therefore x^2 + y^2 = 4^2 + 3^2$

$= 16 + 9 = 25$

453. (d) $\sin x + \cos x = \sqrt{2}\sin x$

$\sin x - \cos x = c$

$$\begin{bmatrix} a\sin x + b\cos x = p \\ b\sin x + a\cos x = c \\ a^2 + b^2 = p^2 + c^2 \end{bmatrix}$$

$\Rightarrow (1)^2 + (1)^2 = (\sqrt{2}\sin x)^2 + c^2$

$\Rightarrow 2 = 2\sin^2 x + c^2$

$\Rightarrow c^2 = 2 - 2\sin^2 x$

$\Rightarrow c^2 = 2(1 - \sin^2 x)$

$\Rightarrow c^2 = 2\cos^2 x$

$\therefore c = \sqrt{2}\cos x$

454. (d) $\sin\theta + \cos\theta = \frac{\sqrt{11}}{3}$

Comparing with $a\sin\theta + b\cos\theta = c$

$a = 1, b = 1, c = \frac{\sqrt{11}}{3}$

$\cos\theta - \sin\theta = \sqrt{a^2 + b^2 - c^2}$

$= \sqrt{1 + 1 - \frac{11}{9}} = \sqrt{\frac{7}{9}} = \frac{\sqrt{7}}{3}$

455. (a) Given, $\sin\theta + \cos\theta = \frac{1}{29}$

Squaring both side

$\Rightarrow 1 + 2\sin\theta.\cos\theta = \frac{1}{841}$

$\Rightarrow 2\sin\theta.\cos\theta = \frac{-840}{841}$

We know that,

$(\sin\theta - \cos\theta)^2 = (\sin\theta + \cos\theta)^2 - 4\sin\theta.\cos\theta$

$= \frac{1}{841} + \frac{1680}{841} = \sqrt{\frac{1681}{841}} = \frac{41}{29}$

$\therefore \frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{\frac{1}{29}}{\frac{41}{29}} = \frac{1}{41}$

Alternate Method:

$\sin\theta + \cos\theta = \frac{1}{29}$

$\sin\theta - \cos\theta = \sqrt{2 - \left(\frac{1}{29}\right)^2} = \sqrt{2 - \frac{1}{841}}$

$= \sqrt{\frac{1682 - 1}{841}} = \sqrt{\frac{1681}{841}} = \frac{41}{29}$

$\therefore \frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{\frac{1}{29}}{\frac{41}{29}} = \frac{1}{41}$

456. (a) $3\sin A + 4\cos A = 5$

$\Rightarrow \frac{3}{5}\sin A + \frac{4}{5}\cos A = 1$

Comparing by $\sin^2\theta + \cos^2\theta = 1$

$\sin A = \frac{3}{5}, \cos A = \frac{4}{5}$

$\therefore \tan A = \frac{\sin A}{\cos A} = \frac{3}{4}$

457. (a) $a\cot\theta + b\,\text{cosec}\,\theta = p$ .....(i)

$b\cot\theta + a\,\text{cosec}\,\theta = q$ .....(ii)

Squaring both (i) and (ii) then subtract

$a^2(\cot^2\theta - \text{cosec}^2\theta) + b^2(\text{cosec}^2\theta - \cot^2\theta) = p^2 - q^2$

$\Rightarrow -a^2 + b^2 = p^2 - q^2 \Rightarrow p^2 - q^2 = b^2 - a^2$

SMART APPROACH:-

$a\cot\theta + b\,\text{cosec}\,\theta = p$

$b\cot\theta + a\,\text{cosec}\,\theta = q$

Let $\theta = 30°$

Then,

$\sqrt{3}a + 2b = p$

$2a + \sqrt{3}b = q$

$p - q = (\sqrt{3} - 2)a + (2 - \sqrt{3})b$

$p + q = (\sqrt{3} + 2)a + (2 + \sqrt{3})b$

$\Rightarrow p^2 - q^2 = -a^2 + b^2 = b^2 - a^2$

458. (c) Given,

$\sqrt{3}\cos\theta + \sin\theta = 1$

from options:-

(b) $\sqrt{3}\cos 60° + \sin 60° = \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2}$

$= \sqrt{3} \neq 1$

(c) $\sqrt{3}\cos 90° + \sin 90° = 1$.

Which satisfied.

459. (b) $\sin^2 t = \frac{1}{2}(\tan t)$

Put $t = 45°$

$\Rightarrow \sin^2 45° = \frac{1}{2}\tan t \Rightarrow \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} \times 1$

$\Rightarrow \frac{1}{2} = \frac{1}{2}$ (satisfied)

460. (d) $(1 + \sin^4 A - \cos^4 A)\,\text{cosec}^2 A$

Let, $A = 45°$

$\Rightarrow (1 + \sin^4 45° - \cos^4 45°)\,\text{cosec}^2 45°$

$= \left[1 + \left(\frac{1}{\sqrt{2}}\right)^4 - \left(\frac{1}{\sqrt{2}}\right)^4\right](\sqrt{2})^2 = 2$

Alternate Method:

$(1 + \sin^4 A - \cos^4 A)\,\text{cosec}^2 A$

$= \{(1 + (\sin^2 A - \cos^2 A)(\sin^2 A + \cos^2 A)\}\,\text{cosec}^2 A$

$= (1 + (\sin^2 A - \cos^2 A)\,\text{cosec}^2 A$

$= (1 - \cos^2 A + \sin^2 A)\,\text{cosec}^2 A$

$= 2\sin^2 A\,\text{cosec}^2 A = 2$

461. (d) $(\cot\theta + \tan\theta)(\text{cosec}\,\theta - \sin\theta)(\cos\theta - \sec\theta)$

Put $\theta = 45°$

$(\cot 45° + \tan 45°)(\text{cosec}\,45° - \sin 45°)(\cos 45° - \sec 45°)$

$= 2 \times \left(\sqrt{2} - \frac{1}{\sqrt{2}}\right) \times \left(\frac{1}{\sqrt{2}} - \sqrt{2}\right)$

$= 2 \times \frac{1}{\sqrt{2}} \times \left(-\frac{1}{\sqrt{2}}\right) = -1$

462. (a) $2\tan^2 A + 4\cos^4 A = 3$

Possible value of $A = 45°$

$\Rightarrow 2 + 4 \times \left(\frac{1}{\sqrt{2}}\right)^4 = 3$

$\Rightarrow 2 + 1 = 3 \Rightarrow 3 = 3$

463. (d) $m = a\sec A$ and $y = b\tan A$

Put, $A = 45°$

$m = a\sqrt{2}, y = b$

$\therefore b^2m^2 - a^2y^2 + \frac{a^2y^2}{b^2m^2} + \cos^2 A$

$= b^2 \times 2a^2 - a^2b^2 + \frac{a^2b^2}{b^2 \times 2a^2} + \cos^2 45°$

$= a^2b^2 + \frac{1}{2} + \frac{1}{2} = a^2b^2 + 1$

464. (d) $m = \sec\theta - \tan\theta$, $n = \text{cosec}\,\theta + \cot\theta$

put $\theta = 45°$

$m = \sqrt{2} - 1, n = \sqrt{2} + 1$

$\therefore m + n(m - 1)$

$= m - n + mn$

$= \sqrt{2} - 1 - \sqrt{2} - 1 + [(\sqrt{2} - 1) \times \sqrt{2} + 1]$

$= -2 + 1 = -1$

465. (b) $\frac{1 - \sin 2t}{1 + \sin 2t} \times \frac{\cos t + \sin t}{\cos t - \sin t}$

Put, $t = 30°$

$\Rightarrow \frac{1 - \sin 60°}{1 + \sin 60°} \times \frac{\cos 30° + \sin 30°}{\cos 30° - \sin 30°}$

$= \frac{1 - \frac{\sqrt{3}}{2}}{1 + \frac{\sqrt{3}}{2}} \times \frac{\frac{\sqrt{3}}{2} + \frac{1}{2}}{\frac{\sqrt{3}}{2} - \frac{1}{2}} = \frac{2 - \sqrt{3}}{2 + \sqrt{3}} \times \frac{\sqrt{3} + 1}{\sqrt{3} - 1}$

Rationalize the denominators.

$= (7 - 4\sqrt{3}) \times \frac{(4 + 2\sqrt{3})}{2}$

$= (7 - 4\sqrt{3}) \times (2 + \sqrt{3})$

$= 14 + 7\sqrt{3} - 8\sqrt{3} - 12 = 2 - \sqrt{3}$

From options (b)

$\frac{1 - \tan 30°}{1 + \tan 30°} = \frac{1 - \frac{1}{\sqrt{3}}}{1 + \frac{1}{\sqrt{3}}} = \frac{\sqrt{3} - 1}{\sqrt{3} + 1}$

$= 2 - \sqrt{3}$

Hence, satisfies.

Alternate Method:-

$\frac{1 - \sin 2t}{1 + \sin 2t} \times \frac{(\cos t + \sin t)}{(\cos t - \sin t)}$

$= \frac{1 - 2\sin t\cos t}{1 + 2\sin t\cos t} \times \frac{\cos t + \sin t}{\cos t - \sin t}$

$= \frac{(\cos t - \sin t)^2}{(\cos t + \sin t)^2} \times \frac{\cos t + \sin t}{\cos t - \sin t}$

$= \frac{\cos t - \sin t}{\cos t + \sin t} = \frac{1 - \tan t}{1 + \tan t}$

466. (a) tan A = a tan B and sin A = b sin B

Let A = 30° and B = 60°

$$\tan 30° = a \tan 60° \Rightarrow \frac{1}{\sqrt{3}} = a\sqrt{3}$$

$$\Rightarrow a = \frac{1}{3}$$

$$\sin 30° = b \sin 60° \Rightarrow \frac{1}{2} = b\,\frac{\sqrt{3}}{2}$$

$$\Rightarrow b = \frac{1}{\sqrt{3}}$$

$$\text{So, } \cos^2 A = \cos^2 30° = \frac{3}{4}$$

Go through options,

$$\frac{b^2-1}{a^2-1} = \frac{\left(\frac{1}{3}\right)-1}{\frac{1}{9}-1} = \frac{\frac{-2}{3}}{\frac{-8}{9}}$$

$$= \frac{-2}{3} \times \frac{9}{-8} = \frac{3}{4}$$

467. (d) $\cot\alpha = \frac{P}{Q}$

Put α = 45° ⇒ P = Q

$$\therefore \frac{P\cos\alpha - Q\sin\alpha}{P\cos\alpha + Q\sin\alpha} - \frac{P^2-Q^2}{P^2+Q^2} + 3$$

$$= \frac{P\cos 45° - Q\sin 45°}{P\cos 45° + Q\sin 45°} - \frac{P^2-P^2}{P^2+P^2}$$

$$+ 3 = 3$$

468. (c) Put A = 45°

$$x = \sin 45° + \cos 45° = \sqrt{2}$$

$$y = \sec A + \text{cosec } A = \sec 45° + \text{cosec}$$

$$45° = 2\sqrt{2}$$

so option (c), $y + 2x = x^2 y$

$$\Rightarrow 2\sqrt{2} + 2\times\sqrt{2} = \left(\sqrt{2}\right)^2 \times 2\sqrt{2}$$

$$\Rightarrow 4\sqrt{2} = 4\sqrt{2}$$

469. (c) $\frac{[(\sin x + \sin y)(\sin y - \sin x)]}{[(\cos x + \cos y)(\cos y - \cos x)]}$

Put $x = 90°$, $y = 0°$

$$\frac{[(\sin 90° + \sin 0°)(\sin 0° - \sin 90°)]}{[(\cos 90° + \cos 0°)(\cos 0° - \cos 90°)]}$$

$$= \frac{[(1+0)(0-1)]}{[(0+1)(1-0)]} = \frac{-1}{1} = -1$$

Alternate Method:

$$\frac{[(\sin x + \sin y)(\sin y - \sin x)]}{[(\cos x + \cos y)(\cos y - \cos x)]}$$

$$= \frac{-\sin^2 x + \sin x.\sin y + \sin^2 y - \sin x.\sin y}{\cos x.\cos y - \cos^2 x + \cos^2 y - \cos x.\cos y}$$

$$= \frac{\sin^2 y - \sin^2 x}{\cos^2 y - \cos^2 x}$$

$$= \frac{1 - \cos^2 y - 1 + \cos^2 x}{\cos^2 y - \cos^2 x}$$

$$= \frac{\cos^2 x - \cos^2 y}{\cos^2 y - \cos^2 x} = -1$$

470. (c) Given,

p = cot A + cosA

q = cotA – cos A

Put A = 45° we get,

$$p = \frac{\sqrt{2}+1}{\sqrt{2}},\ q = \frac{\sqrt{2}-1}{\sqrt{2}}$$

Then go through options.

On checking option (c).

$$\text{LHS} = \sqrt{16pq} = \sqrt{16 \times \frac{\sqrt{2}+1}{\sqrt{2}} \times \frac{\sqrt{2}-1}{\sqrt{2}}}$$

$$= \sqrt{8}$$

$$\text{RHS} = p^2 - q^2 = \frac{3+2\sqrt{2}}{2} - \frac{3-2\sqrt{2}}{2}$$

$$= \frac{4\sqrt{2}}{2} = 2\sqrt{2} = \sqrt{8}$$

471. (d) $\left(\frac{\sin(x-y)}{\sin(x+y)}\right)\left(\frac{\tan x + \tan y}{\tan x - \tan y}\right)$

Put $x = 60°$, $y = 30°$

$$= \left(\frac{\sin 30°}{\sin 90°}\right)\left(\frac{\tan 60° + \tan 30°}{\tan 60° - \tan 30°}\right)$$

$$= \frac{\frac{1}{2}}{1} \times \frac{\sqrt{3} + \frac{1}{\sqrt{3}}}{\sqrt{3} - \frac{1}{\sqrt{3}}} = \frac{1}{2} \times \frac{4}{2} = 1$$

472. (c) cosec (α + β)

$$= \frac{\sec\alpha.\sec\beta \times \text{cosec}\alpha.\text{cosec}\beta}{\sec\alpha.\text{cosec}\beta + \text{cosec}\alpha.\sec\beta}$$

Let α = 45° & β = 30°

∵ cosec75°

$$= \frac{\sec 45°.\sec 30° \times \text{cosec}45°.\text{cosec}30°}{\sec 45°.\text{cosec}30° + \text{cosec}45°.\sec 30°}$$

$$= \frac{\sqrt{2} \times \frac{2}{\sqrt{3}} \times \sqrt{2} \times 2}{\sqrt{2} \times 2 + \sqrt{2} \times \frac{2}{\sqrt{3}}} = \frac{8}{\sqrt{3}} \times \frac{\sqrt{3}}{2\sqrt{2}(\sqrt{3}+1)}$$

$$= \frac{4}{\sqrt{2}(\sqrt{3}+1)} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$= \sqrt{2}(\sqrt{3}-1) = \sqrt{6} - \sqrt{2}$$

SMART APPROACH:-

We know $\sin 75° = \frac{\sqrt{3}+1}{2\sqrt{2}}$

Then, $\text{cosec}75° = \frac{2\sqrt{2}}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$

$$= \frac{2\sqrt{6} - 2\sqrt{2}}{2} = \sqrt{6} - \sqrt{2}$$

473. (d) If α + β = 45°

then (tan α + 1) (tan β + 1) = 2

⇒ 2x = 2 ⇒ x = 1

474. (d) We know,

If A + B = 45°

then (1 + tanA) (1 + tan B) = 2

∴ (1 + tan10°) (1 + tan35°) = 2

475. (c) $\sin^2\theta + \cos^2\theta = 1$

⇒ θ have infinite values

476. (a) a = cot A + cos A ... (i)

b = cot A – cos A ... (ii)

Multiply Eqⁿ (i) × Eqⁿ (ii),

$ab = \cot^2 A - \cos^2 A$

Add Eqⁿ (i) + Eqⁿ (ii)

a + b = 2cotA ... (iii)

Subtract Eqⁿ (i) – Eqⁿ (ii)

a – b = 2cosA ... (iv)

Multiply Eqⁿ (iii) × Eqⁿ (iv)

$a^2 - b^2 = 4\cot A.\cos A$

$$\therefore a^2 - b^2 - 4\sqrt{ab}$$

$$= 4\cot A.\cos A - 4 \times \sqrt{\cot^2 A \times \cos^2 A}$$

$$= 4\cot A.\cos A - 4\cot A.\cos A = 0$$

Alternate Method:

a = cotA + cosA

b = cotA – cosA

Put value of A = 90°

⇒ a = cot90° + cos90° ⇒ a = 0

⇒ b = cot90° – cos90° ⇒ b = 0

$$\therefore a^2 - b^2 - 4\sqrt{ab} = 0$$

477. (b) $\cos^2\theta + \sin\theta + 1 = 0$

$1 - \sin^2\theta + \sin\theta + 1 = 0$

We know

$\sin\theta \le 1$

This is possible only when sinθ = –1

Then,

$$\theta \text{ lies b/w } \left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$$

478. (c) 0° < t < 90°

⇒ sin t < cost when t < 45°

e.g. sin30° < cos30°

$$\Rightarrow \frac{1}{2} < \frac{\sqrt{3}}{2}$$

479. (c) $2\left(\frac{\cos^2 x - \sec^2 x}{\tan^2 x}\right) = a + b\cos^2 x$

$$\Rightarrow 2\frac{\left(\cos^2 x - \frac{1}{\cos^2 x}\right)}{\frac{\sin^2 x}{\cos^2 x}} = a + b\cos^2 x$$

$$\Rightarrow \frac{2(\cos^4 x - 1)}{\sin^2 x} = a + b\cos^2 x$$

$$\Rightarrow \frac{2[(\cos^2 x - 1)(\cos^2 x + 1)]}{\sin^2 x}$$

$$= a + b\cos^2 x$$

$$\Rightarrow -2(\cos^2 x + 1) = a + b\cos^2 x$$

$$\Rightarrow -(2\cos^2 x - 1) - 3 = a + b\cos^2 x$$

$$\Rightarrow -\cos^2 x - 3 = a + b\cos^2 x$$

$$\Rightarrow a = -3,\ b = -1$$

Alternate Method:

Put $x = 30°$,

$$\Rightarrow 2\,\frac{\cos^2 30° - \sec^2 30°}{\tan^2 30°} = a + b\cos 60°$$

$$\Rightarrow 2\,\frac{\frac{3}{4} - \frac{4}{3}}{\frac{1}{3}} = a + \frac{b}{2}$$

$$\Rightarrow 2 \times \frac{9-16}{12} \times 3 = a + \frac{b}{2}$$

$$\Rightarrow -\frac{7}{2} = a + \frac{b}{2}$$

$$\Rightarrow -3 - \frac{1}{2} = a + \frac{b}{2}$$

$$\therefore a = -3,\ b = -1$$

480. (b) Given,

$$x = \frac{2\sin\theta}{1+\cos\theta+\sin\theta}$$

By rationalization

$$\frac{2\sin\theta}{1+\cos\theta+\sin\theta} \times \frac{1-\cos\theta+\sin\theta}{1-\cos\theta+\sin\theta}$$

$$= \frac{2\sin\theta(1-\cos\theta+\sin\theta)}{(1+\sin\theta)^2-(\cos\theta)^2}$$

$$= \frac{2\sin\theta(1-\cos\theta+\sin\theta)}{1+2\sin\theta+\sin^2\theta-\cos^2\theta}$$

$$= \frac{2\sin\theta(1-\cos\theta+\sin\theta)}{2\sin\theta+2\sin^2\theta}$$

$$= \frac{2\sin\theta(1-\cos\theta+\sin\theta)}{2\sin\theta(1+\sin\theta)}$$

$$= \frac{1-\cos\theta+\sin\theta}{1+\sin\theta} = x$$

Alternate Method:

Let, $\sin\theta = \frac{3}{5}$ Then, $\cos\theta = \frac{4}{5}$

$$x = \frac{2\sin\theta}{1+\cos\theta+\sin\theta} = \frac{2\times\frac{3}{5}}{1+\frac{4}{5}+\frac{3}{5}}$$

$$= \frac{\frac{6}{5}}{\frac{12}{5}} = \frac{1}{2} = \frac{1-\cos\theta+\sin\theta}{1+\sin\theta}$$

$$= \frac{1-\frac{4}{5}+\frac{3}{5}}{1+\frac{3}{5}} = \frac{\frac{4}{5}}{\frac{8}{5}} = \frac{1}{2} = x$$

481. (b) $a = \frac{2\sin x}{1+\sin x+\cos x}$,

$b = \frac{c}{1+\sin x}$

a = b

$$\Rightarrow \frac{2\sin x}{1+\sin x+\cos x} = \frac{c}{1+\sin x}$$

$$\Rightarrow c = \frac{2\sin x(1+\sin x)(1+\sin x-\cos x)}{(1+\sin x+\cos x)(1+\sin x-\cos x)}$$

$$\Rightarrow c = \frac{2\sin x(1+\sin x)(1+\sin x-\cos x)}{(1+\sin x)^2-\cos^2 x}$$

$$\Rightarrow c = \frac{2\sin x(1+\sin x)(1+\sin x-\cos x)}{1^2+\sin^2 x+2\sin x-\cos^2 x}$$

$$\Rightarrow c = \frac{2\sin x(1+\sin x)(1+\sin x-\cos x)}{2\sin^2 x+2\sin x}$$

$$\Rightarrow c = \frac{2\sin x(1+\sin x)(1+\sin x-\cos x)}{2\sin x\cdot(\sin x+1)}$$

$$\Rightarrow c = 1+\sin x-\cos x$$

Alternate Method:

Put $x = 90°$

$a = \frac{2}{1+1} = 1$, $b = \frac{c}{1+1} = \frac{c}{2}$

a = b (Given) $\Rightarrow 1 = \frac{c}{2} \Rightarrow c = 2$

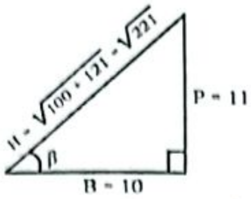
Go through options,

$1 + \sin x - \cos x = 1 + \sin 90° - \cos 90°$
$= 1 + 1 = 2$

482. (b) $\frac{\cos\alpha}{\sin\beta} = 10$ & $\frac{\cos\alpha}{\cos\beta} = 11$

On divinding, $\frac{\sin\beta}{\cos\beta} = \frac{11}{10}$

$$\Rightarrow \tan\beta = \frac{11}{10}$$



$$\cos^2\beta = \left(\frac{B}{H}\right)^2 = \left(\frac{10}{\sqrt{221}}\right)^2 = \frac{100}{221}$$

SMART APPROACH:-
$\cos^2\beta$ is always a perfect square and only option (b) is perfect square.

483. (b) Given,

$$\sin 18° = \frac{\sqrt{5}-1}{4}$$

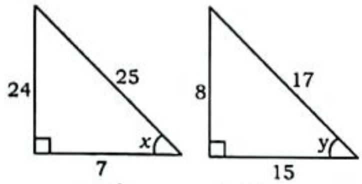
ATQ, $\operatorname{cosec} 18° = \frac{1}{\sin 18°} = \frac{1}{\frac{\sqrt{5}-1}{4}}$

$$= \frac{4}{\sqrt{5}-1}$$

After rationalising

$$\frac{4}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1} = \frac{4(\sqrt{5}+1)}{4} = \sqrt{5}+1$$

484. (a)



$$\cos^{-1}\left(\frac{7}{25}\right) - \cos^{-1}\left(\frac{15}{17}\right) = ?$$

Let, $\cos^{-1}\left(\frac{7}{25}\right) = x$ and $\cos^{-1}\left(\frac{15}{17}\right) = y$

$\because \sin(x-y) = \sin x \cos y - \cos x \sin y$

$$\Rightarrow \sin(x-y) = \frac{24}{25}\times\frac{15}{17} - \frac{7}{25}\times\frac{8}{17}$$

$$\Rightarrow \sin(x-y) = \frac{360-56}{425}$$

$$\Rightarrow \sin(x-y) = \frac{304}{425}$$

$$\Rightarrow x-y = \sin^{-1}\left(\frac{304}{425}\right)$$

485. (a) $\cos^4\theta - \sin^4\theta = \frac{4}{5}$

$$\Rightarrow (\cos^2\theta - \sin^2\theta)(\cos^2\theta + \sin^2\theta) = \frac{4}{5}$$

$$\Rightarrow (\cos^2\theta - \sin^2\theta) = \frac{4}{5}$$

$$\Rightarrow \cos 2\theta = \frac{4}{5}$$

So, $\sin 2\theta = \frac{3}{5}$ [3, 4, 5 are triplet]

$\therefore \sin 4\theta = 2\times\sin 2\theta \times \cos 2\theta$

$$= 2\times\frac{3}{5}\times\frac{4}{5} = \frac{24}{25}$$

486. (b) We know, $\cos 2\theta = 2\cos^2\theta - 1$

$$\Rightarrow \cos^2\theta = \frac{\cos 2\theta + 1}{2}$$

Put $\theta = 15°$

$$\cos^2 15° = \frac{\cos 30° + 1}{2} = \frac{2+\sqrt{3}}{4}$$

487. (d) $\cos^2\theta - \sin^2\theta = \frac{1}{2}$

$[\therefore \cos^2\theta - \sin^2\theta = \cos 2\theta]$
So, $\cos 2\theta = \cos 60°$
$\Rightarrow 2\theta = 60°$
$\Rightarrow \theta = 30°$

488. (d) Given, $\sin\theta = \frac{6}{10}$, $\cos\theta = \frac{8}{10}$

We know,
$\because \sin 2\theta = 2\sin\theta\cos\theta$

$$= 2\times\frac{6}{10}\times\frac{8}{10} = \frac{24}{25}$$

489. (a) Let, $x = 45°$

$$\tan 22.5 = \frac{45°}{2} = \frac{x}{2}$$

ATQ,

$$\tan\frac{x}{2} = \frac{1-\cos x}{\sin x}$$

$$\Rightarrow \tan\frac{45°}{2} = \frac{1-\cos 45°}{\sin 45°}$$

$$\Rightarrow \tan 22.5° = \frac{1-\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}}$$

$$\Rightarrow \tan 22.5° = \frac{\sqrt{2}-1}{\sqrt{2}}\times\sqrt{2} = \sqrt{2}-1$$

490. (d) $4\tan\theta - 3 = 0$

$$\tan\theta = \frac{3\rightarrow P}{4\rightarrow B} \Rightarrow H = 5$$

$$\therefore \frac{1-\cos 2\theta}{1+\cos 2\theta} = \frac{1-(\cos^2\theta-\sin^2\theta)}{1+(\cos^2\theta-\sin^2\theta)}$$

By triplet (3, 4, 5)

$$= \frac{1-\left[\left(\frac{4}{5}\right)^2-\left(\frac{3}{5}\right)^2\right]}{1+\left[\left(\frac{4}{5}\right)^2-\left(\frac{3}{5}\right)^2\right]} = \frac{1-\frac{7}{25}}{1+\frac{7}{25}}$$

$$= \frac{18}{32} = \frac{9}{16}$$

491. (c) $\left(\frac{2\cos^3\theta-\cos\theta}{\sin\theta-2\sin^3\theta}\right)^2+1$

$$= \left[\frac{\cos\theta(2\cos^2\theta-1)}{\sin\theta(1-2\sin^2\theta)}\right]^2+1$$

$[\cos 2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta]$

$$= \left[\frac{\cos\theta\times\cos 2\theta}{\sin\theta\times\cos 2\theta}\right]^2+1$$

$$= \left(\frac{\cos\theta}{\sin\theta}\right)^2+1 = 1+\cot^2\theta = \operatorname{cosec}^2\theta$$

492. (d) $\frac{2\tan A}{1+\tan^2 A}$

$$= \frac{2\frac{\sin A}{\cos A}}{\frac{\cos^2A+\sin^2A}{\cos^2 A}} \quad \left[\therefore \sin 2A = \frac{2\tan A}{1+\tan^2A}\right]$$

$= 2\sin A\cos A = \sin 2A$

Alternate Method:

Put A = 45°

$$\frac{2\tan 45^\circ}{1+\tan^2 45^\circ} = \frac{2}{1+1} = 1$$

Go through options,

$\sin 2A = \sin(2 \times 45^\circ) = \sin 90^\circ = 1$

493. (a) $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

$$= \frac{\sin\theta(1-2\sin^2\theta)}{\cos\theta(2\cos^2\theta-1)} = \frac{\sin\theta}{\cos\theta} = \tan\theta$$

494. (c) $\dfrac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta}$

$$= \frac{\cos\theta\left(2\cos^2\theta - 1\right)}{\sin\theta\left(1-2\sin^2\theta\right)}$$

$$= \frac{\cos\theta \times \cos 2\theta}{\sin\theta \times \cos 2\theta} = \cot\theta$$

Alternate Method:

Put θ = 30°

$$\frac{2\cos^3 30^\circ - \cos 30^\circ}{\sin 30^\circ - 2\sin^3 30^\circ} = \frac{2\times\frac{3\sqrt{3}}{8} - \frac{\sqrt{3}}{2}}{\frac{1}{2} - 2\times\frac{1}{8}}$$

$$= \frac{\frac{3\sqrt{3}}{4} - \frac{\sqrt{3}}{2}}{\frac{1}{2} - \frac{1}{4}} = \frac{3\sqrt{3}-2\sqrt{3}}{4} \times \frac{4}{1} = \sqrt{3}$$

Go through options,

$\cot\theta = \cot 30^\circ = \sqrt{3}$

495. (a) $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}}$

[∵ $\cos 2\theta = 2\cos^2\theta - 1$

$\cos 8\theta = 2\cos^2 4\theta - 1$

$2\cos^2 4\theta = \cos 8\theta + 1$]

$$= \sqrt{2+\sqrt{2+\sqrt{2(1+\cos 8\theta)}}}$$

$$= \sqrt{2+\sqrt{2+\sqrt{2\times 2\cos^2 4\theta}}}$$

$$= \sqrt{2+\sqrt{2+\sqrt{4\cos^2 4\theta}}}$$

$$= \sqrt{2+\sqrt{2+2\cos 4\theta}}$$

$$= \sqrt{2+\sqrt{2(1+\cos 4\theta)}}$$

$$= \sqrt{2+\sqrt{2\times 2\cos^2 2\theta}}$$

$$= \sqrt{2+2\cos 2\theta} = \sqrt{2(1+\cos 2\theta)}$$

$$= \sqrt{2\times 2\cos^2\theta} = 2\cos\theta$$

496. (c) $\dfrac{\left(2\cos^3 A - \cos A\right)}{\left(\sin A - 2\sin^3 A\right)} = 1$

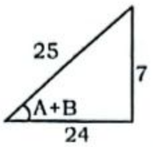
$$\Rightarrow \frac{\cos A\left(2\cos^2 A - 1\right)}{\sin A\left(1-2\sin^2 A\right)} = 1$$

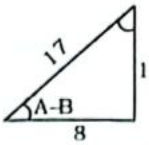
$$\Rightarrow \cot A \times \frac{\cos 2A}{\cos 2A} = 1$$

⇒ cotA = cot45°

⇒ A = 45°

497. (c) $\cos(A+B) = \dfrac{24}{25}, \sin(A-B) = \dfrac{15}{17}$





$$\tan(2A) = \tan\left[(A+B)+(A-B)\right]$$

$$= \frac{\tan(A+B)+\tan(A-B)}{1-\tan(A+B)+\tan(A-B)}$$

$$= \frac{\frac{7}{24}+\frac{15}{8}}{1-\frac{7}{24}\times\frac{15}{8}} = \frac{\frac{52}{24}}{\frac{29}{64}} = \frac{416}{87}$$

498. (b) $\sin 3A = 3\sin A - 4\sin^3 A$

499. (c) $\sin 3A = 3\sin A - 4\sin^3 A$

$\therefore 3\sin 15^\circ - 4\sin^3 15^\circ = \sin(3 \times 15^\circ)$

$$= \sin 45^\circ = \frac{1}{\sqrt{2}}$$

500. (d) Given, A = 60°, B = 30°

We know,

sinA cosB + cosA sinB = sin(A + B)

= sin(60° + 30°) = sin 90° = 1

501. (c) cos (A + B) = cosA.cosB – sinA.sin B

Let, A = 45°, B = 30°

∴ cos 75° = cos(45° + 30°)

= cos45°.cos30° – sin45°. sin30°

$$= \frac{1}{\sqrt{2}}\times\frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}}\times\frac{1}{2}$$

$$= \frac{1}{\sqrt{2}}\left(\frac{\sqrt{3}}{2}-\frac{1}{2}\right) = \frac{\sqrt{3}-1}{2\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{\sqrt{6}-\sqrt{2}}{4}$$

502. (d) Given, ∠B = 90°

Remaining ∠A + ∠C = 90°

sin(A + C) = sin(90°) = 1

503. (b) $\cos(x+y) - \sin(x-y) + \tan 2z$

$= \cos x\cos y - \sin x\sin y - \sin x\cos y$

$$+ \cos x\sin y + \frac{2\tan z}{1-\tan^2 z}$$

504. (b) $\tan(A-B) = \dfrac{\tan A - \tan B}{1+\tan A\tan B}$

$$\therefore \tan(72^\circ - 27^\circ) = \frac{\tan 72^\circ - \tan 27^\circ}{1+\tan 72^\circ.\tan 27^\circ}$$

⇒ 1 + tan72°.tan27° = tan72° – tan27°

⇒ tan72° – tan27° – tan72°.tan27° = 1

Note: In these type of questions whenever the difference of angle = 45° answer will be 1.

505. (b) sin (X – Y) = sinX cosY – cosX sinY

$$\therefore \frac{\sin(A-B)}{\cos A\cos B} + \frac{\sin(B-C)}{\cos B\cos C}$$

$$= \frac{\sin A\cos B - \cos A\sin B}{\cos A\cos B}$$

$$+ \frac{\sin B\cos C - \cos B\sin C}{\cos B\cos C}$$

$$= \frac{\begin{array}{c}\sin A\cos B\cos C - \cos A\sin B\cos C\\ +\sin B\cos C\cos A - \cos B\sin C\cos A\end{array}}{\cos A\cos B\cos C}$$

$$= \frac{\cos B(\sin A\cos C - \sin C\cos A)}{\cos A\cos B\cos C}$$

$$= \frac{\sin(A-C)}{\cos A\cos C}$$

Alternate Method:

Put B = C = 0°

ATQ,

$$\frac{\sin A}{\cos A} = \tan A$$

Only option (b) satisfied

506. (c) cosec31° = sec59°

$$\therefore \left[\frac{\operatorname{cosec}31^\circ - \sec 59^\circ}{(\sin 18^\circ + \cos 72^\circ)} \times \frac{\tan 26^\circ}{\cot 64^\circ}\right] + \left[\frac{\tan 30^\circ + \tan 15^\circ}{(1-\tan 30^\circ\tan 15^\circ)}\right]$$

$$= 0 + \frac{\tan 30^\circ + \tan 15^\circ}{1-\tan 30^\circ \times \tan 15^\circ}$$

= tan(30° + 15°) = tan45° = 1

507. (c) $\dfrac{\cos 13^\circ + \sin 13^\circ}{\cos 13^\circ - \sin 13^\circ}$

Divide numerator and denominator by cos13°

$$\Rightarrow \frac{\cos 13^\circ(1+\tan 13^\circ)}{\cos 13^\circ(1-\tan 13^\circ)}$$

$$= \frac{\tan 45^\circ + \tan 13^\circ}{1-\tan 45^\circ \times \tan 13^\circ}$$

= tan(45° + 13°) = tan58°

508. (a) $\dfrac{\tan 71^\circ + \tan 19^\circ}{1-\tan 71^\circ.\tan 19^\circ}$

= tan(71° + 19°)

= tan 90° = Not defined

$$\left[\tan(A+B) = \frac{\tan A + \tan B}{1-\tan A\times\tan B}\right]$$

509. (c) Given,

$$\tan(A-B) = \frac{\tan A - \tan B}{1+\tan A\tan B}$$

Put A = 45° and B = 30°

$$\tan(45^\circ - 30^\circ) = \frac{\tan 45^\circ - \tan 30^\circ}{1+\tan 45^\circ\tan 30^\circ}$$

$$= \frac{1-\frac{1}{\sqrt{3}}}{1+(1)\left(\frac{1}{\sqrt{3}}\right)} = \frac{\sqrt{3}-1}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}+1}$$

$$= \frac{\sqrt{3}-1}{\sqrt{3}+1}\times\frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}\right)^2-(1)^2}$$

$$= \frac{3-2\sqrt{3}+1}{3-1} = \frac{4-2\sqrt{3}}{2}$$

$$= \frac{2\left(2-\sqrt{3}\right)}{2} = 2-\sqrt{3}$$

$\therefore \tan 15^\circ = 2-\sqrt{3}$

510. (a) sin (A + B) = cos (A + B)

$$\Rightarrow \frac{\sin(A+B)}{\cos(A+B)} = 1$$

⇒ tan (A + B) = 1

$\Rightarrow \frac{\tan A + \tan B}{1 - \tan A \tan B} = 1$

$\Rightarrow$ tan A + tan B = 1 − tan A tan B

$\Rightarrow$ tan A + tan B tan A = 1 − tan B

$\Rightarrow$ tan A (1 + tan B) = 1 − tan B

$\Rightarrow \tan A = \frac{1 - \tan B}{1 + \tan B}$

Alternate Method:

sin(A + B) = cos(A + B)

Put, A = 0, B = 45°

Now,

tanA = tan0° = 0

Now check option

Put B = 45°

Which option given us zero

$\frac{1 - \tan B}{1 + \tan B} = \frac{1-1}{1+1} = 0$

Hence, option (a) is satisfy

511. (b) $\sin A = \frac{4}{5}$, $\sin B = \frac{15}{17}$

$\Rightarrow \cos A = \frac{3}{5}$, $\cos B = \frac{8}{17}$

∴ sin (A − B) = sin A cos B − cos A

$\sin B = \frac{4}{5} \times \frac{8}{17} - \frac{3}{5} \times \frac{15}{17}$

$= \frac{32}{85} - \frac{45}{85} = -\frac{13}{85}$

512. (c) $\frac{\cos x - \sqrt{3}\sin x}{2}$

$= \frac{1}{2}\cos x - \frac{\sqrt{3}}{2}\sin x$

$= \cos 60° \cos x - \sin 60° \sin x$

$= \cos(60° + x) = \cos\left(\frac{\pi}{3} + x\right)$

513. (a) tanA −tanB − tanC = tanA tanB tanC

$\Rightarrow$ tanA−tanB=tanA tanB tanC + tanC

$\Rightarrow$ tanA − tanB = tanC (tanA tanB + 1)

$\Rightarrow \tan C = \frac{\tan A - \tan B}{\tan A \tan B + 1}$

$\Rightarrow$ tanC = tan(A − B)

$\Rightarrow$ C = A − B

$\Rightarrow$ A = B + C

514. (a) tan (α + β) = a, tan (α − β) = b

tan 2α = tan (α + β + α − β)

Let α + β = a, α − β = b

$\therefore \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$

$\tan 2\alpha = \frac{a + b}{1 - ab}$

Alternate Method:

tan(α + β) = a, tan(α − β) = b

Put α = 30°, β = 0

$\tan 30° = a \Rightarrow a = \frac{1}{\sqrt{3}}$

$\tan 30° = b \Rightarrow b = \frac{1}{\sqrt{3}}$

$\tan 2\alpha = \tan 60° = \sqrt{3}$

Go through options,

$\frac{a+b}{1-ab} = \frac{\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}}}{1 - \frac{1}{\sqrt{3}} \times \frac{1}{\sqrt{3}}} = \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}} = \frac{2}{\sqrt{3}} \times \frac{3}{2}$

$= \sqrt{3}$

515. (c) $\tan A \tan B + \frac{\cos x}{\cos A \cos B} = 1$

$\Rightarrow \frac{\sin A \sin B}{\cos A \cos B} + \frac{\cos x}{\cos A \cos B} = 1$

$\Rightarrow$ sinA sinB + cos$x$ = cosA cosB

$\Rightarrow$ cos$x$ = cosA cosB − sinA sinB

$\Rightarrow$ cos$x$ = cos (A + B)

$\Rightarrow$ x = A + B

Alternate Method:

Put A = B = 45°

$\tan 45° \tan 45° + \frac{\cos x}{\cos 45° \cos 45°} = 1$

$\Rightarrow$ 1 + 2 cos$x$ = 1

$\Rightarrow$ cos$x$ = 0

$\Rightarrow$ x = 90° = A + B

516. (c) Given,

$\sin A = \frac{1}{3}$

$\therefore \cos A = \sqrt{1 - \sin^2 A} = \sqrt{1 - \left(\frac{1}{3}\right)^2} = \frac{2\sqrt{2}}{3}$

$\sin B = \frac{1}{5}$

$\therefore \cos B = \sqrt{1 - \sin^2 B} = \sqrt{1 - \left(\frac{1}{5}\right)^2} = \frac{2\sqrt{6}}{5}$

Since the angles given in the second quadrant.

So,

$\cos A = \frac{-2\sqrt{2}}{3} \Rightarrow \cos B = \frac{-2\sqrt{6}}{5}$

We know that–

cos(A − B) = cosAcosB + sinAsinB

$= \frac{-2\sqrt{2}}{3} \times \frac{-2\sqrt{6}}{5} + \frac{1}{3} \times \frac{1}{5}$

$= \frac{2\sqrt{2}}{3} \times \frac{2\sqrt{2} \times \sqrt{3}}{5} + \frac{1}{3} \times \frac{1}{5} = \frac{8\sqrt{3}+1}{15}$

517. (a) We know that,

sin(A + B) = sinAcosB + cosAsinB

$\therefore \frac{\sin(A+B)}{\sin A \cos B}$

$= \frac{\sin A \cos B + \cos A \sin B}{\sin A \cos B}$

$= \frac{\sin A \cos B}{\sin A \cos B} + \frac{\cos A \sin B}{\sin A \cos B}$

= 1 + cotA tanB

Alternate Method:

Put A = 60°, B = 30°

$\frac{\sin 90°}{\sin 60° \cos 30°} = \frac{1}{\frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}} = \frac{4}{3}$

Go through options,

1 + cotA tanB = 1 + cot60° tan30°

$= 1 + \frac{1}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = 1 + \frac{1}{3} = \frac{4}{3}$

518. (a) ∵ sinC + sinD

$= 2\sin\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right)$

∴ sin75° + sin15° = 2sin45°.cos30°

$= 2 \times \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{\sqrt{2}} = \frac{\sqrt{6}}{2}$

519. (a) sin2x + 2sin4x + sin6x

= (sin6x + sin2x) + 2sin4x

$\boxed{\sin A + \sin B = 2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)}$

$= 2\sin\frac{6x+2x}{2} \cos\frac{6x-2x}{2} + 2\sin 4x$

$= 2\sin 4x \cos 2x + 2\sin 4x$

$= 2\sin 4x(\cos 2x + 1)$

[We know, $\cos 2x + 1 = 2\cos^2 x$]

$= 2 \sin 4x \times 2\cos^2 x$

$= 4\cos^2 x \sin 4x$

Alternate Method:

Put θ = 30°

sin60° + 2sin120° + sin180°

$= \frac{\sqrt{3}}{2} + 2 \times \frac{\sqrt{3}}{2} + 0 = \frac{3\sqrt{3}}{2}$

By option (A)

$4\cos^2 x.\sin 4x$

$= 4 \times \frac{3}{4} \times \frac{\sqrt{3}}{2} = \frac{3\sqrt{3}}{2}$

520. (a) By formula,

$\sin\alpha - \sin\beta = 2\cos\frac{\alpha+\beta}{2}\sin\frac{\alpha-\beta}{2}$

521. (a) $\frac{\sin 4\theta + \sin 2\theta}{\cos 4\theta + \cos 2\theta}$

Using the formula:

$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2}$

$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2}$

$\therefore \frac{\sin 4\theta + \sin 2\theta}{\cos 4\theta + \cos 2\theta} = \frac{2\sin 3\theta \cos\theta}{2\cos 3\theta \cos\theta}$

= tan3θ

522. (d) cos(36° + A) cos (36° − A) + cos (54° + A) cos (54° − A)

We know,

$\boxed{\cos(A+B).\cos(A-B) = \cos^2 A - \sin^2 B}$

$= \cos^2.36 - \sin^2 A + \cos^2 54 - \sin^2 A$

$= \cos^2 36 - \sin^2 A + \sin^2 36 - \sin^2 A$

$= 1 - \sin^2 A - \sin^2 A$

$= \cos^2 A - \sin^2 A = \cos 2A$

523. (b) $\cos 75° \cos 15° = \frac{1}{2}$

[cos(75° + 15°) + cos(75° − 15°)]

$= \frac{1}{2}[\cos 90° + \cos 60°]$

$= \frac{1}{2}\left[\frac{1}{2}\right] = \frac{1}{4}$

524. (d) By option,

$\sin A \sin B = \frac{1}{2}\{\cos(A-B) - \cos(A+B)\}$

By value putting, let A = 60°, B = 30°

LHS = sinA sinB = sin60° × sin30°

$= \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{\sqrt{3}}{4}$

$$\text{RHS} = \frac{1}{2}\{\cos(A-B) - \cos(A+B)\})$$

$$= \frac{1}{2}(\cos 30° - \cos 90°)$$

$$= \frac{1}{2}\left\{\frac{\sqrt{3}}{2} - 0\right\} = \frac{\sqrt{3}}{4}$$

525. (d) $\dfrac{\sin 8\theta \cos\theta - \sin 6\theta \cos 3\theta}{\cos 2\theta \cos\theta - \sin 3\theta \sin 4\theta}$

Multiplying and dividing by 2

$$= \frac{\sin 8\theta \cos\theta - \sin 6\theta \cos 3\theta}{\cos 2\theta \cos\theta - \sin 3\theta \sin 4\theta} \times \frac{2}{2}$$

$$= \frac{2\sin 8\theta \cos\theta - 2\sin 6\theta \cos 3\theta}{2\cos 2\theta \cos\theta - 2\sin 3\theta \sin 4\theta}$$

[We know,

2sinAcosB = sin(A + B) + sin(A –B)

2cosAcosB = cos(A + B) + cos(A –B)

2sinAsinB = cos(A – B) – cos(A + B)]

$$= \frac{\sin 9\theta + \sin 7\theta - (\sin 9\theta + \cos 3\theta)}{\cos 3\theta + \cos\theta - (\cos\theta - \cos 7\theta)}$$

$$= \frac{\sin 7\theta - \sin 3\theta}{\cos 3\theta + \cos 7\theta} = \frac{2\cos 5\theta \sin 2\theta}{2\cos 5\theta \cos 2\theta}$$

$$= \tan 2\theta$$

[We know,

$$\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$$

$$\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)]$$

526. (d) Max value of $(a\sin\theta + b\cos\theta)$

$= \sqrt{a^2+b^2}$

Here, a = 2, b = 3

∴ Max value of $(2\sin\theta + 3\cos\theta)$

$= \sqrt{4+9} = \sqrt{13}$

527. (a) Maximum value of a sinA + cosA

$= \sqrt{a^2+b^2}$

Maximum value of 7cosA + 24 sinA

$= \sqrt{7^2+24^2} = 25$

∴ 7cosA + 24 sinA + 32 = 25 + 32 = 57

528. (a) $19\sin\theta + 6\cot\theta \sin\theta$

$= 19\sin\theta + 6 \times \dfrac{\cos\theta}{\sin\theta} \times \sin\theta$

$= 19\sin\theta + 6\cos\theta$

∴ Max value $= \sqrt{19^2+6^2} = \sqrt{397}$

529. (d) Least value of $a\,\text{cosec}^2\theta + b\sin^2\theta$

$= 2\sqrt{ab}$

Least value of $16\,\text{cosec}^2\theta + 25\sin^2\theta$

$= 2\sqrt{16\times 25} = 2 \times 4 \times 5 = 40$

530. (d) We have,

$\sin\theta \cos\theta$

Now, this can be written us

$\sin\theta . \cos\theta = \dfrac{1}{2}(2\sin\theta\cos\theta)$

[∴ $\sin 2\theta = 2\sin\theta\cos\theta$]

as, we know that

$-1 \le \sin nx \le 1 \quad n = 1, 2 \ldots. A$

Here, $-1 \le \sin nx$ [for minimum]

Hence, minimum value of $\sin 2\theta$ is -1

Required least value is $\left(\dfrac{-1}{2}\right)$

531. (c) $(\sin^{12}\theta + \cos^{20}\theta)$

[We know, $\sin^2\theta + \cos^2\theta = 1$

$\cos^2\theta = 1 - \sin^2\theta$]

$= (\sin^2\theta)^6 + (\cos^2\theta)^{10}$

$= (\sin^2\theta)^6 + (1 - \sin^2\theta)^{10}$

The maximum value of $\sin^2\theta = 1$

$= (1)^6 + (1-1)^{10} = 1 + 0 = 1$

532. (b) $\sin^4\theta + \cos^4\theta$

$= (\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta$

$= 1 - 2\sin^2\theta\cos^2\theta$

⇒ $\sin^2\theta\cos^2\theta$ should be minimum which is '0'.

∴ max value $= 1 - 2 \times 0 = 1$

Alternate Method:

Whenere the powers of sin & cos are even then then maximum value of $\sin^n\theta + \cos^n\theta$ is always 1.

SELECTION मंत्र #07

“How to handle failure?”

#Hacks:-

☞ **Accept & Analyze the Failure–**

- Accept that failure is part of the process, not the end.
- Analyze your mistakes: Was it lack of preparation, time management, revision, or exam pressure?
- Check your score vs. cut-off to identify weak areas.

☞ **Reset Your Mindset –**

- Take a short break to refresh your mind, but don't dwell on negativity.
- Watch success stories of aspirants who cleared after multiple attempts (e.g., SSC, UPSC, Banking).
- Remind yourself: "Many have faced setbacks but succeeded. I will too!"

☞ **Make a Better Study Plan–**

- Focus on weak areas: Improve sections where you lost marks.
- Revise more smartly: Use PYQs, mock tests, and short notes.
- Time Management: Improve speed and accuracy with timed practice.

☞ **Believe in Yourself–**

- Your experience from failure is an asset, not a burden.
- Success may take time, but with persistence and smart effort, you WILL crack it!
- **Tips:** Restart with full energy—your selection is just one right attempt away

23
Chapter

HEIGHT & DISTANCE

• TYPE – I •

1. A 20 m long ladder rests against a wall so that the angle between the ladder and the wall is 30°. How far (in m) is the base of the ladder from the wall?
SSC CGL 19/04/2022 (Shift-02)
(a) $10\sqrt{3}$ (b) $20\sqrt{3}$
(c) 10 (d) 20

2. From a point P on a level ground, the angle of elevation of the top of a tower is 30°. If the tower is $110\sqrt{3}$ m high, what is the distance (in m) of point P from the foot of the tower?
SSC CGL 12/04/2022 (Shift-03)
(a) 330 (b) 220
(c) 115 (d) 110

3. A person standing at a distance looks at a building having a height of 1000 metres. The angle between the top of the building and the ground is 30°. At what approximate distance (in metres) is the person standing away from the building.
SSC CGL 17/07/2023 (Shift-04)
(a) 1000 (b) 936
(c) 1732 (d) 1542

4. A ladder leaning against a wall makes an angle θ with the horizontal ground such that $\cos\theta = \frac{5}{13}$. If the height of the top of the ladder from the wall is 18 m, then what is the distance (in m) of the foot of the ladder from the wall?
SSC CPO 23/11/2020 (Shift-01)
(a) 19.5 (b) 13
(c) 7.5 (d) 18

5. The angle of depression of the boat from the masthead of a 180 m high ship is 60°. Find the distance (in m) of the boat from the ship.
SSC CGL 21/04/2022 (Shift-01)
(a) 360 (b) $60\sqrt{3}$
(c) $180\sqrt{3}$ (d) 180

6. A pole 10m long rests scantly against a vertical wall AB making an angle 30° with the horizontal (ground). Find how far the foot of the pole is from the wall (in metres).
SSC CGL 10/09/2024 (Shift-01)
(a) 15 (b) $\frac{5}{\sqrt{3}}$
(c) 10 (d) $5\sqrt{3}$

7. The angle of elevation of the top of a building at a distance of 70 m from its foot on a horizontal plane is found to be 60°. Find the height of the building.
SSC CGL TIER-II 03/03/2023
(a) $70\sqrt{3}$ m (b) $60\sqrt{3}$ m
(c) $50\sqrt{3}$ m (d) $70\sqrt{2}$ m

8. A ladder of length 3.5 m just reaches the top of a wall. If the ladder makes an angle of 60° with the wall, then what is the height of the wall (in m)?
SSC CGL 20/04/2022 (Shift-03)
(a) 1.75 (b) $\frac{7\sqrt{3}}{4}$
(c) $35\sqrt{3}$ (d) $\frac{3.5}{\sqrt{3}}$

9. From a point P on a level ground, the angle of elevation of the top of the tower is 30°. If the distance of point P from the foot of the tower is 510 m, then 50% of the height of the tower (in m) is:
SSC CGL 13/04/2022 (Shift-02)
(a) $\frac{85\sqrt{3}}{3}$ (b) 85
(c) $85\sqrt{3}$ (d) $150\sqrt{3}$

10. A pole stands vertically on the ground with the help of a 12-metre steel wire tied to its top and fixed on the ground. If the steel wire makes an angle of 30° with the horizontal ground, then the height of the pole is equal to:
SSC CHSL TIER-II 02/11/2023
(a) 6 m (b) 8 m
(c) $6\sqrt{3}$ m (d) $8\sqrt{3}$ m

11. The length of the shadow of a vertical pole on the ground is 36 m. If the angle of elevation of the sun at that time is θ, such that $\sec\theta = \frac{13}{12}$ then what is the height (in m) of the pole?
SSC CPO 24/11/2020 (Shift-01)
(a) 12 (b) 9
(c) 18 (d) 15

12. A kite is attached to a string. Find the length of the string (in m) when the height of the kite is 90 m and the string makes an angle of 30° with the ground.
SSC CGL 11/04/2022 (Shift-03)
(a) 180 (b) $90\sqrt{3}$
(c) 45 (d) $60\sqrt{3}$

13. A ladder is resting against a wall. The angle between the foot of the ladder and wall is 60°, and the foot of the ladder is 3.6 m away from the wall. The length of the ladder (in m) is:
SSC CPO 24/11/2020 (Shift 02)
(a) 5.4 (b) 3.6
(c) 14.4 (d) 7.2

14. The length of the shadow on the ground of a tall tree of height 45 m is $15\sqrt{3}$ m. What is the angle (in degrees) of elevation of the sun?
SSC CGL 13/04/2022 (Shift-03)
(a) 60° (b) 90°
(c) 45° (d) 30°

15. The length of the shadow on the ground of a tall tree of height 30 m is $10\sqrt{3}$ m. What is the angle (in degrees) of elevation of the sun?
SSC CGL 19/04/2022 (Shift-01)
(a) 60° (b) 15°
(c) 30° (d) 45°

• TYPE – II •

16. The length of the shadow of the vertical tower on level ground increases by 10m when the altitude of the sun changes from 45° to 30°. The height of the tower is:
SSC CGL Tier-II (18/11/2020)
(a) $10(\sqrt{3}+1)$ m (b) $10\sqrt{3}$ m
(c) $5\sqrt{3}$ m (d) $5(\sqrt{3}+1)$ m

17. A and C are two points on the same side of a ground, 50 metres apart. The angles of elevation of these points to the top of a tree are 60° and 30°, respectively. What is 40% of the height of the tree (in m)?
SSC CGL 20/04/2022 (Shift-02)
(a) $5\sqrt{3}$ (b) $10\sqrt{3}$
(c) $15\sqrt{3}$ (d) $25\sqrt{3}$

18. The angle of elevation of the top of a tall building from the points M and N at the distances of 72 m and 128 m, respectively, from the base of the building and in the same straight line with it, are comple-mentary. The height of the building (in m) is:
SSC CGL 12/04/2022 (Shift-02)
(a) 84 (b) 96
(c) 80 (d) 90

19. A man observed the top of an electric pole from two different observation points P and Q at angles of elevation of 60° and 30° respectively. If the distance between P and Q is 10m, find the height (in m) of the pole.
SSC CHSL TIER-II 10/01/2024
(a) $15\sqrt{3}$ (b) 15
(c) $5\sqrt{3}$ (d) 5

20. The length of the shadow of a vertical tower on level ground increases by 8.4 m when the altitude of the sun changes from 45° to 30°. What is the height of the tower (in m)?

SSC CGL 21/04/2022 (Shift-03)

(a) $4.2(\sqrt{3}+3)$ (b) $4.2(\sqrt{3}-1)$

(c) $4.2(\sqrt{3}+1)$ (d) $8.4(\sqrt{3}+3)$

21. The foot of a ladder 25 m long is 7 m from the base of the building. If the top of the ladder slips by 4 m, then by how much distance will the foot of the ladder slide?

SSC CHSL 24/05/2022 (Shift-01)

(a) 9 m (b) 7 m

(c) 6 m (d) 8 m

22. A poster is on top of a building. A person is standing on the ground at a distance of 50 m from the building. The angles of elevation to the top of the poster and bottom of the poster are 45° and 30°, respectively. What is 200% of the height (in m) of the poster?

SSC CGL 18/04/2022 (Shift-02)

(a) $\frac{25}{3}(3-\sqrt{3})$ (b) $\frac{75}{3}(3-\sqrt{3})$

(c) $\frac{50}{3}(3-\sqrt{3})$ (d) $\frac{100}{3}(3-\sqrt{3})$

23. The angle of elevation of the top of an unfinished tower at a point distant 78m from its base is 30°. How much higher must the tower be raised (in m) so that the angle of elevation of the top of the finished tower at the same point will be 60°?

SSC CGL 11/04/2022 (Shift-01)

(a) $78\sqrt{3}$ (b) 80

(c) $52\sqrt{3}$ (d) $26\sqrt{3}$

◆ TYPE – III ◆

24. Exactly midway between the foot of two towers P and Q, the angles of elevation of their tops are 45° and 60°, respectively. The ratio of the heights of P and Q is:

SSC CGL 18/04/2022 (Shift-01)

(a) $1:\sqrt{3}$ (b) 3:1

(c) 1 : 3 (d) $\sqrt{3}$: 1

25. A pole 23 m long reaches a window which is $3\sqrt{5}$ m above the ground on one side of a street. Keeping its foot at the same point, the pole is turned to the other side of the street to reach a window $4\sqrt{15}$ m high. What is the width (in m) of the street?

SSC CGL 11/04/2022 (Shift-02)

(a) 17 (b) 35

(c) 39 (d) 22

26. Two pillars of equal height stand on either side of a roadway which is 150 m wide. At a point in the road between pillars, the elevations of the pillars are x° and y° so that $\tan x^\circ = \frac{2}{5}$, $\tan y^\circ = \frac{3}{5}$, then the height of each pillar is:

SSC CGL TIER-II 26/10/2023

(a) 39 m (b) 42 m

(c) 36 m (d) 33 m

27. Let A and B be two towers with same base. From the midpoint of the line joining their feet, the angles of elevation of the tops of A and B are 30° and 60°, respectively. The ratio of the heights of B and A is:

SSC CPO 24/11/2020 (Shift-02)

(a) 1 : 3 (b) 3 : 1

(c) 1 : 2 (d) $1:\sqrt{3}$

28. Two ships are on the opposite of a light house such that all three of them are collinear. The angles of depression of the two ships from the top of the light house are 30° and 60°. If the ships are $230\sqrt{3}$ m apart, then find the height of the light house (in m).

SSC CGL TIER-II 02/03/2023

(a) 175.4 (b) 165.2

(c) 172.5 (d) 180.5

◆ TYPE – IV ◆

29. A person 1.8 metre tall is $30\sqrt{3}$ metre away from a tower. If the angle of elevation from his eye to the top of the tower is 30°, then what is the height (in m)of the tower?

SSC CGL TIER-II 08/08/2022

(a) 37.8 (b) 31.8

(c) 32.5 (d) 30.5

30. Asha and Suman's mud forts have heights 9 cm and 16 cm. They are 24 cm apart. How far (in cm) are the fort tops from each other?

SSC CPO 23/11/2020 (Shift-02)

(a) 16 (b) 7

(c) 25 (d) 24

31. Two poles of heights 10 m and 17 m are fixed to a level ground. The distance between the bottom of the poles is 24 m. What is the distance (in m) between their tops?

SSC CGL 18/04/2022 (Shift-01)

(a) 27 (b) 25

(c) 24 (d) 30

32. From the top of an upright pole 17.75 m high, the angle of elevation of the top of an upright tower was 60°. If the tower was 57.75 m tall, how far away (in m) from the foot of the pole was the foot of the tower?

SSC CGL TIER-II 03/03/2023

(a) $40\sqrt{3}$ (b) $\frac{151\sqrt{3}}{6}$

(c) $\frac{77}{4}\sqrt{3}$ (d) $\frac{40\sqrt{3}}{3}$

33. The angle of elevation of the top of an upright tower from the top of a straight pole $24\sqrt{3}$ feet high is 60°. If the base of the pillar was at a distance of 60 feet from the base of the tower, what was the height (in feet) of the tower?

SSC CGL TIER-II 06/03/2023

(a) $44\sqrt{3}$ (b) $36\sqrt{3}$

(c) $60\sqrt{3}$ (d) $84\sqrt{3}$

34. The tops of two poles of heights 18 m and 30.5 m are connected by a wire. If the wire makes an angle of 30° with the horizontal, what is the length (in m) of the wire?

SSC CGL 20/04/2022 (Shift-01)

(a) 36 (b) 28

(c) 20 (d) 25

35. From the top of a 195 m high cliff the angles of depression of the top and bottom of a tower are 30° and 60°, respectively. Find the height of the tower (in m).

SSC CGL 18/04/2022 (Shift-03)

(a) 65 (b) 195

(c) 130 (d) $195\sqrt{3}$

36. A vertical pole and a vertical tower are on the same level of ground in such a way that from the top of the pole, the angle of elevation of the top of the tower is 60° and the angle of depression of the bottom of the tower is 30°. If the height of the tower is 76 m, then find the height (in m) of the pole.

SSC CGL 11/04/2022 (Shift-02)

(a) 38 (b) $19\sqrt{3}$

(c) 19 (d) 57

37. A vertical pole and a vertical tower are on the same level ground in such a way that, from the top of the pole, the angle of elevation of the top of the tower is 60° and the angle of depression of the bottom of the tower is 30°. If the height of the pole is 24 m, then find the height of the tower (in m).

SSC CGL 12/04/2022 (Shift-01)

(a) $24\sqrt{3}(\sqrt{3}+1)$ (b) 72

(c) 96 (d) $24(\sqrt{3}+1)$

◆ TYPE – V ◆

38. A vertical pole of length 6m casts a 4m long shadow on the ground. At the same time, a tower casts a 28m long shadow. Find the height of the tower.

SSC CHSL 11/07/2024 (Shift-02)

(a) 36 m (b) 42 m

(c) 32 m (d) 48 m

39. A vertical pole of 28 meters height casts a 19.2 meters long shadow. At the same time, find the length of the shadow cast by another pole of 52.5 meters height.

SSC CGL 20/07/2023 (Shift-04)

(a) 36 m (b) 35 m

(c) 40 m (d) 30 m

40. A mirror is placed on the ground facing upwards. A man sees the top of a tower in the mirror which is at a distance of 105 m from the mirror. The man is 0.5 m away from the mirror, and his height is 1.5 m. Find the height of the tower (in metres).

SSC CHSL 10/07/2024 (Shift-01)

(a) 315 (b) 115
(c) 210 (d) 280

41. A man looks at the reflection of the top of the lamp-post on the mirror that is 6.6 m away from the foot of the lamp post. The man's height is 1.25 m and he is standing 2 m away from the mirror. Assuming that the mirror is placed on the ground, facing the sky and the man, and that the mirror and the lamp-post are in a same line, find the height of the lamp-post (in metres).

SSC CHSL 04/07/2024 (Shift-01)

(a) 4.28 (b) 4.45
(c) 3.97 (d) 4.13

42. Subhas and a 3.15 meter tall tree and a building are in such a dwelling position (standing) that their bases (feet) are collinear on the ground and the tree, is located between the building and Subhas. The tree is situated at a distance of 7.5 m from Subhas and the building is situated at a distance of 45 m. Moreover, Subhas eyes, the height of the tree and the height of the building are in the same line, and Suhas eyes are 1.8 meters above the floor. Find the height (in m) of the building.

SSC CHSL 14/08/2023 (Shift-02)

(a) 11.25
(b) 11.50
(c) 10.25
(d) 10.75

43. A person was standing on a road near a mall. He was 1425 m away from the mall and able to see the top of the mall from the road in such a way that the top of a tree which is in between him and the mall was exactly in line of sight with the top of the mall. The tree height is 10 m and it is 30 m away from him. How tall (in m) is the mall?

SSC CPO 23/11/2020 (Shift-01)

(a) 475
(b) 300
(c) 425
(d) 525

44. A person was standing on a road near a mall. He was 1215 m away from the mall and able to see the top of the mall from the road in such a way that the top of a tree, which is in between him and the mall, exactly in line of sight with the top of the mall. The tree height is 20 m and it is 60 m away from him. How tall (in m) is the mall?

SSC CPO 25/11/2020 (Shift-01)

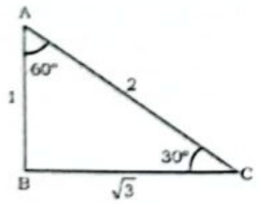
(a) 375 (b) 300
(c) 405 (d) 250

ANSWER KEY

1.	(a)	2.	(a)	3.	(c)	4.	(c)	5.	(b)	6.	(d)	7.	(a)	8.	(a)	9.	(c)	10.	(a)
11.	(d)	12.	(a)	13.	(d)	14.	(a)	15.	(a)	16.	(d)	17.	(b)	18.	(b)	19.	(c)	20.	(c)
21.	(d)	22.	(d)	23.	(c)	24.	(a)	25.	(c)	26.	(c)	27.	(b)	28.	(c)	29.	(b)	30.	(c)
31.	(b)	32.	(d)	33.	(d)	34.	(d)	35.	(c)	36.	(c)	37.	(c)	38.	(b)	39.	(a)	40.	(a)
41.	(d)	42.	(a)	43.	(a)	44.	(c)												

SOLUTIONS

1. (a)



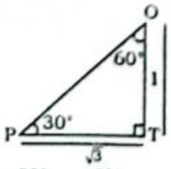
Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

$\downarrow \times 10$ $\downarrow \times 10$

$\boxed{10\sqrt{3}\text{m}}$ 20m

2. (a) Given, OT = $110\sqrt{3}$ m

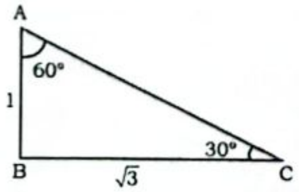


Angle → 30° 60°

Side → 1 : $\sqrt{3}$

$110\sqrt{3}$ 330

3. (c)



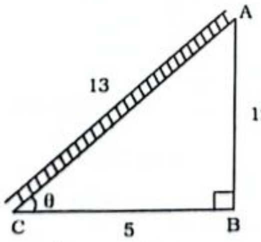
Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

$\times 1000 \downarrow$ $\downarrow \times 1000$

1000 m $1000\sqrt{3}$ = 1732 m

4. (c)



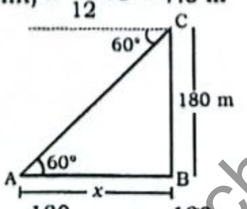
$\cos\theta = \frac{5}{13} = \frac{\text{Base}}{\text{Hypotenuse}}$

$AB = \sqrt{13^2 - 5^2} = 12$

$\because$ AB (12 unit) = 18 m

BC (5 unit) = $\frac{18}{12} \times 5 = 7.5$ m

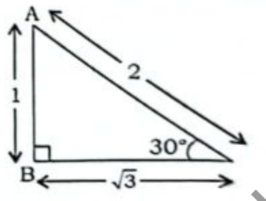
5. (b)



$\tan 60° = \frac{180}{x} \Rightarrow \sqrt{3} = \frac{180}{x}$

$\Rightarrow x = \frac{180}{\sqrt{3}} \Rightarrow AB = x = 60\sqrt{3}$

6. (d)



$\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}}$

$\Rightarrow \cos 30° = \frac{\text{Base}}{10} \Rightarrow \frac{\sqrt{3}}{2} = \frac{\text{Base}}{10}$

$\Rightarrow$ Base = $5\sqrt{3}$ m

Alternate Method:

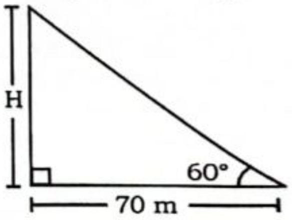
Perpendicular : Base : Hypotenuse

1 : $\sqrt{3}$: 2

$\downarrow \times 5$ $\downarrow \times 5$

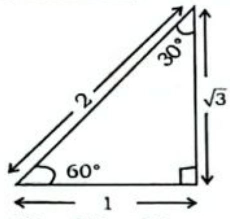
$5\sqrt{3}$m 10

7. (a)



$\tan 60° = \frac{H}{70} \Rightarrow H = 70\sqrt{3}$

Alternate Method:



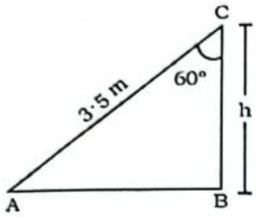
Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

$\downarrow\times70$ $\quad\downarrow\times70$

70 m $\boxed{70\sqrt{3}\text{ m}}$

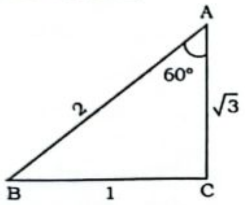
8. (a)



$\cos 60^\circ = \frac{h}{3.5} \Rightarrow \frac{1}{2} = \frac{h}{3.5}$

⇒ BC = h = 1.75 m

Alternate Method:-



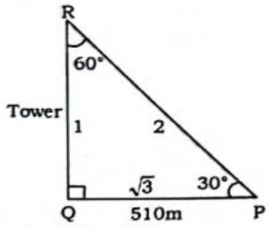
Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

↓ ↓

1.75m 3.5m

9. (c)


R
60°
Tower
1
2
√3
30°
Q
510m
P

Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

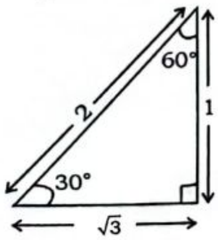
↓ ↓

$170\sqrt{3}$m 510

50% of height of tower

$= 170\sqrt{3} \times \frac{1}{2} = 85\sqrt{3}$

10. (a)



Angle → 90° 60° 30°

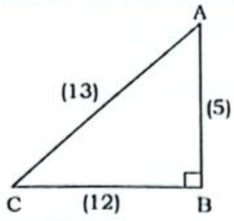
Side → 2 : $\sqrt{3}$: 1

$\times6\downarrow$ $\quad\downarrow\times6$

12 m 6 m

Height of pole = 6 m.

11. (d)



$\because \sec\theta = \frac{13}{12} = \frac{H}{B}$

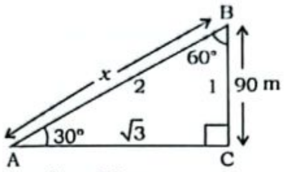
$AB = \sqrt{13^2 - 12^2} = 5$

∵ BC = 12 unit = 36 m

AB = 5 unit = 15 m

Height of the pole = 15 m

12. (a)

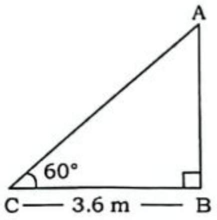

B
x
60°
2
1
90 m
30°
√3
A
C

BC = 1 unit = 90 m

AB = 2 unit = 2 × 90 = 180 m

∴ Length of string (x) = 180 m

13. (d)

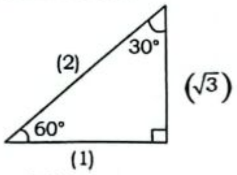


$\because \cos\theta = \frac{B}{H}$

$\Rightarrow \cos 60^\circ = \frac{3.6}{AC}$

$\Rightarrow \frac{1}{2} = \frac{3.6}{AC} \Rightarrow AC = 7.2\text{ m}$

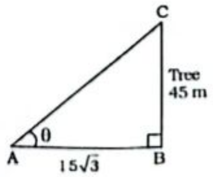
Alternate Method:-



1 unit = 3.6 m

⇒ 2 unit = 7.2 m

14. (a)

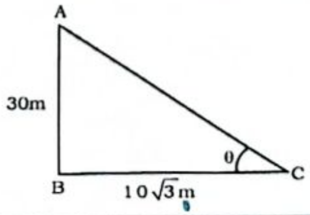

C
Tree
45 m
θ
A
15√3
B

$\tan\theta = \frac{BC}{AB}$

$\Rightarrow \tan\theta = \frac{45}{15\sqrt{3}} \Rightarrow \tan\theta = \sqrt{3}$

$\Rightarrow \tan\theta = \tan 60^\circ \Rightarrow \theta = 60^\circ\ (\tan 60^\circ = \sqrt{3})$

15. (a)


A
30m
θ
B
10√3 m
C

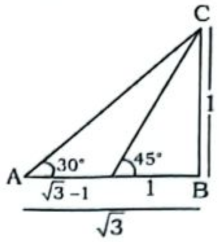
$\tan\theta = \frac{AB}{BC}$

$\Rightarrow \tan\theta = \frac{30}{10\sqrt{3}} = \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$\Rightarrow \tan\theta = \sqrt{3}$

$\Rightarrow \theta = 60^\circ$

16. (d)

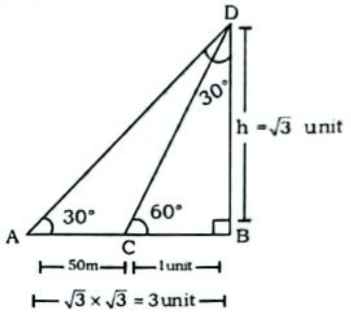

C
1
30°
45°
A
√3 −1
1
B
√3

$(\sqrt{3}-1)$ unit → 10m

1 unit → $\frac{10}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$

$= \frac{10\times(\sqrt{3}+1)}{2} = 5(\sqrt{3}+1)$

17. (b)


D
30°
h = √3 unit
30°
60°
A
C
B
50m
1unit
√3 × √3 = 3unit

AC = 2 unit → 50m

DB = $\sqrt{3}$ unit → $25\sqrt{3}$

40% of height of the tree

$AB = 25\sqrt{3} \times \frac{2}{5}$

$= 10\sqrt{3}$ m

Alternate Method:

$d = h(\cot\theta_1 - \cot\theta_2)$

$\Rightarrow 50 = (\cot 30^\circ - \cot 60^\circ)$

$\Rightarrow 50 = h\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)$

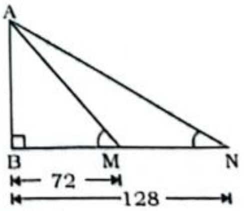
$\Rightarrow 50 = h \times \frac{2}{\sqrt{3}}$

$\Rightarrow h = 25\sqrt{3}$ m

40% of height of the tree

$= 25\sqrt{3} \times \frac{2}{5} = 10\sqrt{3}$ m

18. (b)



We know that,

If ∠AMB + ∠ANB = 90°, then

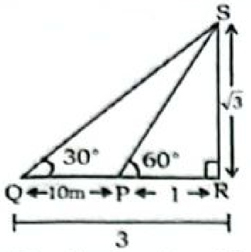
$AB = \sqrt{BM \times BN}$

$= \sqrt{72 \times 128} = \sqrt{36 \times 2 \times 64 \times 2}$

= 8 × 6 × 2 = 96 m

Height of building = 96 m

19. (c)


S
$\sqrt{3}$
30°
60°
Q ← 10m → P ← 1 → R
3

QP = (3 − 1) = 2 unit → 10 m

∴ $\sqrt{3}$ unit → $5\sqrt{3}$ m

∴ Height of the pole = $5\sqrt{3}$ m

Alternate Method:

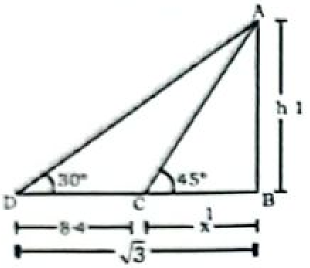
d = h(cot θ_1 − cot θ_2)

⇒ 10 = (cot 30° − cot 60°)

$$\Rightarrow 10 = h\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)$$

$$\Rightarrow 10 = h \times \frac{2}{\sqrt{3}} \Rightarrow h = 5\sqrt{3}\text{ m}$$

20. (c)


A
h 1
30°
45°
D
C
B
8.4
x 1
$\sqrt{3}$

Given that, DC = 8.4 cm

($\sqrt{3}$ − 1) unit = 8.4 m

$$\text{AB (1 unit)} = \frac{8.4}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{8.4(\sqrt{3}+1)}{2} = 4.2(\sqrt{3}+1)$$

Alternate Method:

d = h(cot θ_1 − cot θ_2)

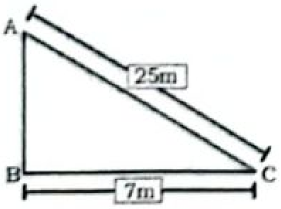
⇒ 8.4 = h(cot 30° − cot 45°)

⇒ 8.4 = h($\sqrt{3}$ − 1)

$$\Rightarrow h = \frac{8.4}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{8.4(\sqrt{3}+1)}{2} = 4.2(\sqrt{3}+1)$$

21. (d)

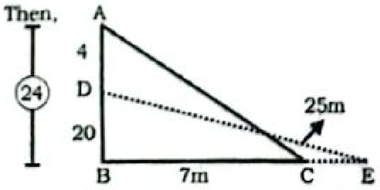


$$AB = \sqrt{25^2 - 7^2} = \sqrt{625-49}$$

$$= \sqrt{576} = 24$$

Now, ladder slips by 4 meter

Then,

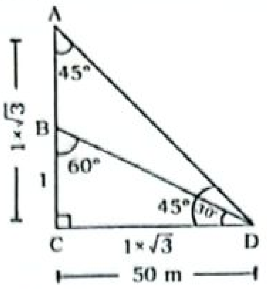

A
4
24
D
20
25m
B
7m
C
E

$$BE = \sqrt{(25)^2 - (20)^2} = \sqrt{625-400}$$

$$= \sqrt{225} = 15\text{ m}$$

CE = (BE − BC) = (15 − 7) = 8 m

22. (d) Now,


A
45°
$1 \times \sqrt{3}$
B
60°
1
45°
30°
C
$1 \times \sqrt{3}$
D
50 m

AB = ($\sqrt{3}$ − 1) unit

$\sqrt{3}$ unit = 50 m

$$(\sqrt{3} - 1)\text{ unit} = \frac{50}{\sqrt{3}} \times (\sqrt{3} - 1)$$

$$= \frac{50}{3} \times (3 - \sqrt{3})$$

∴ 200% of the height of the poster

$$(AB) = \frac{100}{3}\left(3 - \sqrt{3}\right)$$

Alternate Method:

AB = D(tanθ_1 − tanθ_2)

= 50(tan 45° − tan30°)

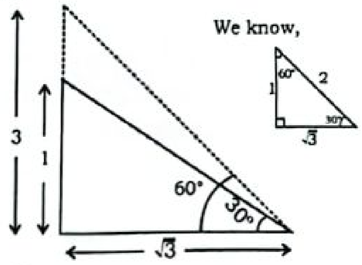
$$= 50\left(1 - \frac{1}{\sqrt{3}}\right) = 50 \times \left(\frac{\sqrt{3}-1}{\sqrt{3}}\right)$$

$$= \frac{50(3-\sqrt{3})}{3}$$

200% of height of poster

$$= 2 \times \frac{50(3-\sqrt{3})}{3} = \frac{100}{3}\left(3 - \sqrt{3}\right)$$

23. (c)

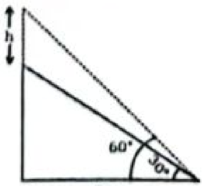

3
1
60°
30°
$\sqrt{3}$
We know,
60°
2
1
30°
$\sqrt{3}$

$\sqrt{3}$ unit = 78 m

$$(3 - 1 = 2\text{ units}) = \frac{78}{\sqrt{3}} \times 2$$

$$= \frac{156\sqrt{3}}{3} = 52\sqrt{3}$$

Alternate Method:



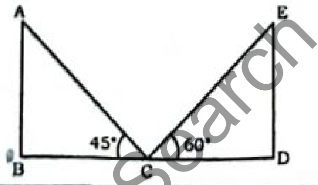
h = D(tanθ_1 − tanθ_2)

= 78(tan 60° − tan30°)

$$= 78\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) = 78 \times \frac{2}{\sqrt{3}} = \frac{156\sqrt{3}}{3}$$

$$= 52\sqrt{3}$$

24. (a)



In figure,

$$\tan 45° = \frac{AB}{BC} \Rightarrow AB = BC \text{ and,}$$

$$\tan 60° = \frac{DE}{CD} \Rightarrow DE = CD\sqrt{3}$$

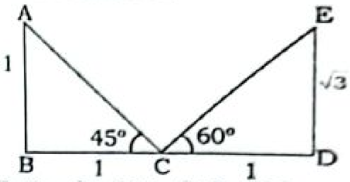
ATQ,

BC = CD

∴ Ratio of height of AB : DE

= 1 : $\sqrt{3}$

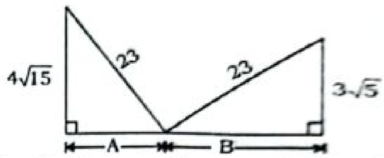
Alternate Method:


A
E
1
$\sqrt{3}$
45°
60°
B
1
C
1
D

∴ Ratio of height of AB : DE

= 1 : $\sqrt{3}$

25. (c)


$4\sqrt{15}$
23
23
$3\sqrt{5}$
A
B

Using Pythagoras theorem in both triangles,

$23^2 = (4\sqrt{15})^2 + A^2$

$$\therefore A = \sqrt{529-240}$$

$$= \sqrt{289} = 17\text{ m}$$

Also,

$23^2 = (3\sqrt{5})^2 + B^2$

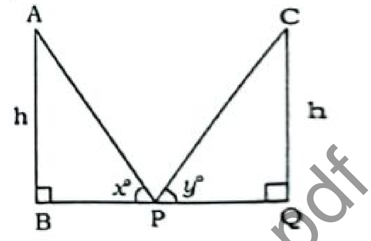
$$\therefore B = \sqrt{529-45}$$

$$= \sqrt{484} = 22\text{ m}$$

Width of street = A + B

= 17 + 22 = 39 m

26. (c) Let height of each Pillar is h & the point between the road is P



$$\therefore \tan x = \frac{h}{BP} = \frac{2 \times 3}{5 \times 3} = \frac{6}{15}$$

$$\tan y = \frac{h}{PQ} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$$

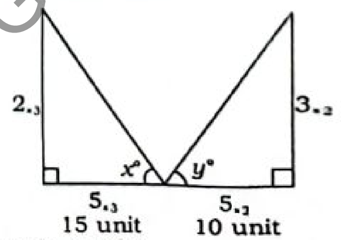
∴ BP + PQ → 150m

25 unit → 150 m

∴ 6 unit → 6 × 6 = 36 m

So height of each pillar = 36 m.

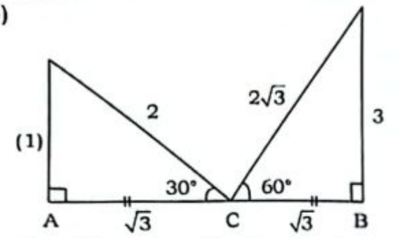
Alternate Method:


$2_{\times 3}$
$3_{\times 2}$
x°
y°
$5_{\times 3}$
15 unit
$5_{\times 2}$
10 unit

25 unit → 150m

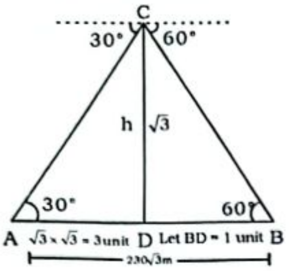
$$6\text{ unit} \rightarrow \frac{150}{25} \times 6 = 36\text{ m}$$

27. (b)


(1)
2
$2\sqrt{3}$
3
30°
60°
A
$\sqrt{3}$
C
$\sqrt{3}$
B

Ratio of height of B : A = 3 : 1

28. (c)

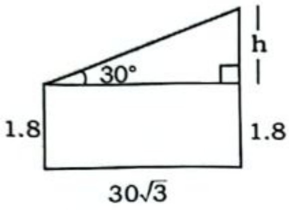

C
30°
60°
h
$\sqrt{3}$
30°
60°
A $\sqrt{3}\times\sqrt{3}$ = 3unit D Let BD = 1 unit B
$230\sqrt{3}$m

ATQ, 4 unit → $230\sqrt{3}$ m

$\Rightarrow \sqrt{3}$ unit $= \frac{230\sqrt{3}}{4}\times\sqrt{3} = 172.5$

$\therefore$ CD = 172.5 m

29. (b)


h
30°
1.8
1.8
$30\sqrt{3}$

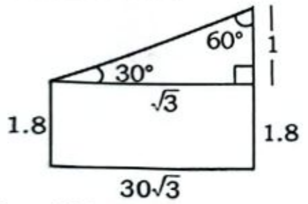
$\tan 30° = \frac{h}{30\sqrt{3}}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{30\sqrt{3}}$

$\Rightarrow$ h = 30

Height of tower = 30 + 1.8
= 31.8m

Alternate Method:


60°
1
30°
$\sqrt{3}$
1.8
1.8
$30\sqrt{3}$

Angle → 30° 60° 90°

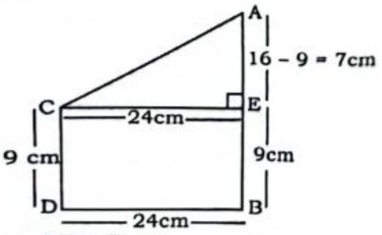
Side → 1 : $\sqrt{3}$: 2

$\downarrow\times 30$ $\downarrow\times 30$

30m $30\sqrt{3}$

Height of tower = 30 + 1.8
= 31.8m

30. (c)


A
16 – 9 = 7cm
C
24cm
E
9 cm
9cm
D
B
24cm

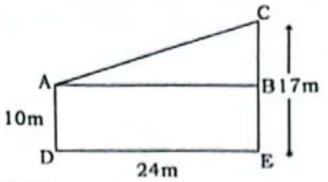
$\because$ AE = 7 cm

$\Rightarrow$ CE = 24 cm

AC = $\sqrt{24^2+7^2} = \sqrt{576+49}$

$= \sqrt{625}$ = 25 cm

31. (b)


C
A
B
17m
10m
D
24m
E

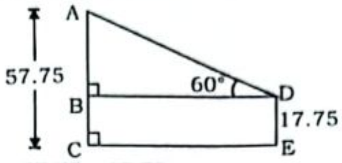
In ΔABC,

BC = 17 – 10 = 7

AB = DE = 24

$\therefore$ AC = $\sqrt{24^2+7^2}$ = 25 cm

32. (d)


A
57.75
60°
D
B
17.75
C
E

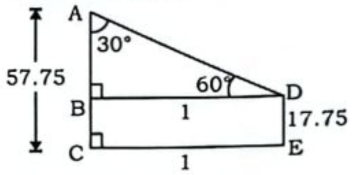
AB = 57.75 – 17.75
= 40 m

$\Rightarrow \tan 60° = \frac{AB}{BD} = \frac{AB}{CE}$

$\Rightarrow \sqrt{3} = \frac{40}{CE}$

$\therefore CE = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3}$

Alternate Method:


A
30°
57.75
60°
D
B
1
17.75
C
1
E

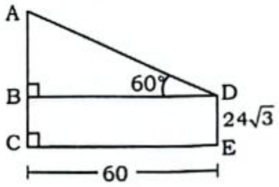
Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

$\downarrow$ $\downarrow$

$\frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3}$m 40m

33. (d)


A
B
60°
D
$24\sqrt{3}$
C
E
60

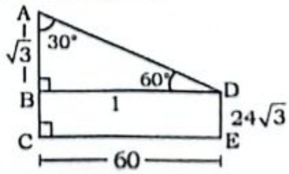
$\tan 60° = \frac{AB}{CE} = \frac{AB}{60}$

$\Rightarrow AB = 60\sqrt{3}$

$\therefore AC = 60\sqrt{3} + 24\sqrt{3}$

$= 84\sqrt{3}$ m

Alternate Method:


A
$\sqrt{3}$
30°
60°
D
B
1
$24\sqrt{3}$
C
E
60

BD = CE = 60m

Angle → 30° 60° 90°

Side → 1 : $\sqrt{3}$: 2

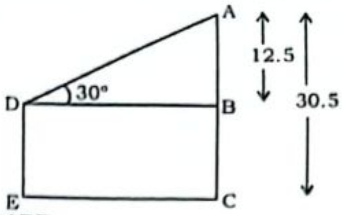
$\downarrow$ $\downarrow$

60m $\boxed{60\sqrt{3}}$

Total height = $24\sqrt{3} + 60\sqrt{3}$

$= 84\sqrt{3}$ m

34. (d)


A
12.5
30.5
D
30°
B
E
C

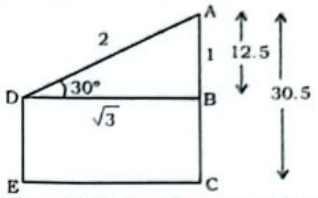
In ΔABD,

$\sin 30° = \frac{12.5}{AD}$

$\Rightarrow \frac{1}{2} = \frac{12.5}{AD}$

$\Rightarrow$ AD = 25 m

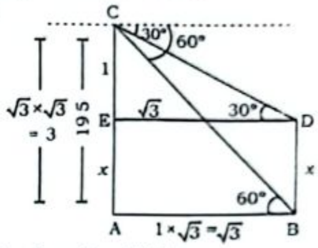
Alternate Method:


A
2
1
12.5
30.5
D
30°
B
$\sqrt{3}$
E
C

1 unit = 12.5 m $\Rightarrow$ 2 unit = 25 m

Length of wire = 25 m

35. (c)

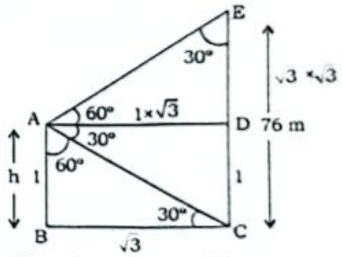

C
30°
60°
1
$\sqrt{3}\times\sqrt{3}$ = 3
195
E
$\sqrt{3}$
30°
D
x
x
60°
A
$1\times\sqrt{3} = \sqrt{3}$
B

AC = 3 unit = 195 m

AE = 2 unit = $\frac{195}{3}\times 2$ = 130 m

Height of the tower = 130 m

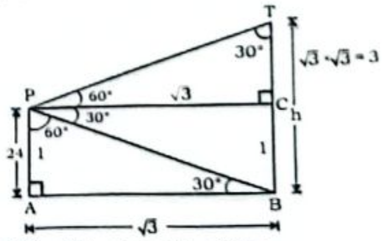
36. (c)


E
30°
$\sqrt{3}\times\sqrt{3}$
A
60°
$1\times\sqrt{3}$
D
76 m
30°
60°
h
1
1
30°
B
$\sqrt{3}$
C

EC = (3 + 1) = 4 unit → 76

DC = 1 unit = 19m

37. (c)

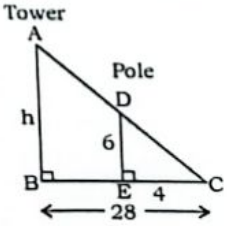

T
30°
$\sqrt{3}\cdot\sqrt{3} = 3$
P
60°
$\sqrt{3}$
C
30°
h
60°
24
1
1
30°
A
B
$\sqrt{3}$

BC = PA $\Rightarrow$ 1 unit → 24m

BC + TC = TB

$\Rightarrow$ 4 unit → 24 × 4 = 96m

38. (b)

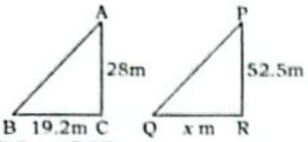

Tower
A
Pole
D
h
6
B
E
4
C
28

ATQ,
Since, ΔABC and ΔDEC are similar

$$\frac{DE}{AB} = \frac{EC}{BC}$$

$$\frac{6}{h} = \frac{4}{28} \Rightarrow h = 42\text{ m}$$

39. (a)

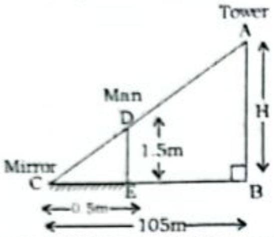


ΔABC ~ ΔPQR

Then, $\frac{28}{19.2} = \frac{52.5}{x}$

$$\Rightarrow x = \frac{52.5 \times 19.2}{28} = 36\text{m}$$

40. (a) Let height of tower = h

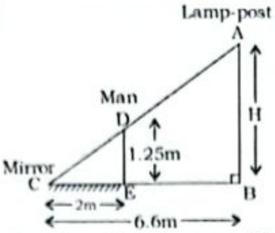


Since, ΔABC and ΔDEC are similar

$$\frac{EC}{BC} = \frac{DE}{AB}$$

$$\frac{0.5}{105} = \frac{1.5}{h} \Rightarrow h = 3 \times 105 = 315\text{ m}$$

41. (d)



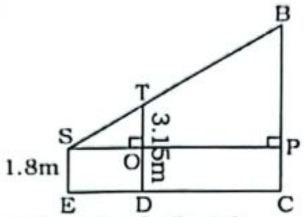
Let, height of lamp-post = H
Since, ΔABC and ΔCDE are similar

$$\frac{CE}{BC} = \frac{DE}{AB}$$

$$\therefore \frac{2}{6.6} = \frac{1.25}{H}$$

$$\Rightarrow H = 1.25 \times 3.3 = 4.125\text{m}$$
$$= 4.13\text{m}$$

42. (a)



$$TO = TD - OD = 3.15 - 1.8$$
$$= 1.35\text{ m}$$

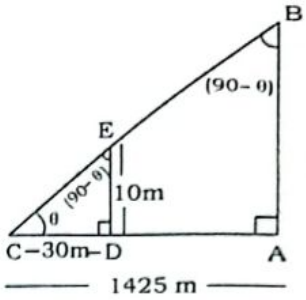
ΔSOT ~ ΔSPB

$$\Rightarrow \frac{SO}{SP} = \frac{TO}{BP} \Rightarrow \frac{7.5}{45+7.5} = \frac{1.35}{BP}$$

$$\Rightarrow BP = \frac{1.35 \times 52.5}{7.5} = 9.45\text{ m}$$

Height of Building = (BP + PC)
= 9.45 + 1.8
= 11.25 m

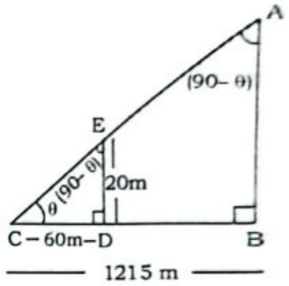
43. (a)



$$\frac{DE}{CD} = \frac{AB}{AC} \Rightarrow \frac{10}{30} = \frac{AB}{1425}$$

$$\Rightarrow AB = 475\text{ m}$$

44. (c)



$$\frac{DE}{CD} = \frac{AB}{AC} \Rightarrow \frac{20}{60} = \frac{AB}{1215}$$

$$\Rightarrow AB = \frac{1215}{3} = 405\text{ m}$$

SPEED BOOSTER HACKS

◆ Two Digit Multiplication Trick ◆

$$\begin{array}{r} 3\ 7 \\ \times\ 1\ 4 \\ \hline \end{array}$$

Step I: $\begin{array}{cc} 3 & \boxed{7} \\ 1 & \boxed{4} \end{array}$ = 28, we will write 8 & 2 will be taken as carry

Step II: $\begin{array}{cc} 3 & 7 \\ 1 & 4 \end{array}$ = 12 + 7 + **2** = 21, we will write 1 & 2 will be taken as carry

Step III: $\begin{array}{cc} \boxed{3} & 7 \\ \boxed{1} & 4 \end{array}$ = 3 + **2** = 5

Hence, 14 × 37 = 518

◆ Do it Yourself ◆

$$\begin{array}{r} 3\ 4 \\ \times\ 2\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 5\ 6 \\ \times\ 6\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 6\ 9 \\ \times\ 8\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 9\ 7 \\ \times\ 7\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 8\ 9 \\ \times\ 6\ 7 \\ \hline \end{array} \qquad \begin{array}{r} 4\ 9 \\ \times\ 3\ 7 \\ \hline \end{array}$$

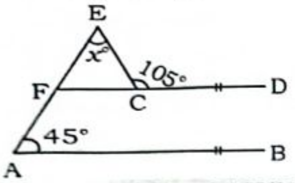
$$\begin{array}{r} 2\ 3 \\ \times\ 1\ 3 \\ \hline \end{array} \qquad \begin{array}{r} 5\ 7 \\ \times\ 7\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 7\ 9 \\ \times\ 8\ 6 \\ \hline \end{array}$$

24 Chapter

GEOMETRY

◆ TYPE – I (A) ◆
LINES AND ANGLE

In the given figure find x.



SSC Phase-XII 25/06/2024 (Shift-02)

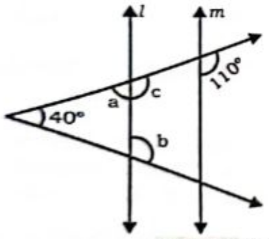
(a) 60° (b) 50°
(c) 45° (d) 30°

If a transversal line intersects two parallel lines, and the difference between two interior angles on the same side of the transversal line is 40°, then find the smallest angle among the interior angles.

SSC CHSL TIER-II 10/01/2024

(a) 60° (b) 50°
(c) 40° (d) 70°

In the following figure, if $l \,||\, m$, then find the measures of angles marked by a and b.



SSC CGL 08/12/2022 (Shift-04)

(a) a = 90° and b = 90°
(b) a = 55° and b = 125°
(c) a = 70° and b = 110°
(d) a = 60° and b = 120°

◆ TYPE – I (B) ◆
FUNDAMENTAL PROPERTIES OF TRIANGLE

For triangles, which of the following statement(s) are true?

1. Sum of all interior angles is 180°
2. All interior angles can't be equal
3. Can have at the most one obtuse angle
4. Sum of two sides may or may not be equal to the third side

SSC CGL 26/09/2024 (Shift-01)

(a) (i) and (ii)
(b) (ii), (iii) and (iv)
(c) (i), (ii) and (iv)
(d) (i) and (iii)

5. In the following sets, which set represents the angles of a triangle?

SSC CGL 13/09/2024 (Shift-03)

(a) {30°, 60°, 90°}
(b) {80°, 50°, 90°}
(c) {30°, 50°, 110°}
(d) {30°, 50°, 90°}

6. In a ΔPQR, ∠P + ∠Q = 84°. Find the value of ∠R.

SSC CGL 26/09/2024 (Shift-03)

(a) 74° (b) 96°
(c) 60° (d) 120°

7. The angles of a triangle are such that one angle is the average of the other two angles, then which of the following will be the angles?

1) $\frac{\pi}{6}, \frac{\pi}{3}, \frac{\pi}{2}$ 2) $\frac{\pi}{3}, \frac{\pi}{3}, \frac{\pi}{2}$
3) $\frac{\pi}{6}, \frac{\pi}{3}, \frac{\pi}{4}$ 4) $\frac{\pi}{2}, \frac{\pi}{2}, \frac{\pi}{3}$

SSC CGL 09/09/2024 (Shift-02)

(a) 4 (b) 3
(c) 2 (d) 1

8. If the angles of a triangle are $(x - 46)°$, $(x + 96)°$ and $8x°$, then what is the value of $2x$?

SSC CGL 01/12/2022 (Shift-02)

(a) 15° (b) 24°
(c) 26° (d) 13°

9. If the angles of a triangle are in the ratio 7 : 8 : 3, then the value of the largest angle is:

SSC CGL 26/09/2024 (Shift-01)

(a) 120° (b) 80°
(c) 100° (d) 60°

10. The angles of a triangle are in the ratio 1 : 2 : 3. The difference in the largest and smallest angle is (in degrees):

SSC CGL 24/09/2024 (Shift-03)

(a) 60° (b) 15°
(c) 45° (d) 30°

11. The measures of the three angles of a triangle are in the ratio 17 : 13 : 15. Find the positive difference between the greatest and the smallest of these three angles.

SSC CGL 12/09/2024 (Shift-01)

(a) 16° (b) 24°
(c) 20° (d) 12°

12. If the angles of a triangle are in the ratio of 9 : 11 : 16, then the difference between the greatest angle and the smallest angle is:

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 40° (b) 35°
(c) 25° (d) 30°

13. The angles of a triangle are in the ratio 1 : 1 : 2. What percentage of the total internal angle is the greatest angle?

SSC CPO 09/11/2022 (Shift-01)

(a) 50% (b) 65%
(c) 45% (d) 40%

14. In ΔABC, ∠A – ∠B = 33°, ∠B – ∠C = 18°. what is the sum of the smallest and the largest angle of the triangle?

SSC CGL TIER-II (15/11/2020)

(a) 143° (b) 108°
(c) 92° (d) 125°

15. P, Q and R are the three angles of a triangle. If P – Q = 20° and Q – R = 26°, then ∠P is equal to:

SSC CGL 19/09/2024 (Shift-01)

(a) 52° (b) 46°
(c) 92° (d) 82°

16. In a ΔABC, if $\frac{1}{2}\angle A + \angle B + \angle C = 120°$, then the value of $\frac{1}{4}\angle A$ is:

SSC CGL 11/09/2024 (Shift-03)

(a) 20° (b) 40°
(c) 60° (d) 30°

17. If the angles P, Q and R of ΔPQR satisfy the relation 2R – P = Q – R, then find the measure of ∠R.

SSC CHSL 07/08/2023 (Shift-01)

(a) 45° (b) 60°
(c) 50° (d) 55°

18. In ΔPQR, if 4∠P = 5∠Q = 20∠R, then the value of ∠Q is:

SSC CGL 23/09/2024 (Shift-03)

(a) 72° (b) 36°
(c) 90° (d) 45°

19. The angles of a triangles are in AP (arithmetic progression). If measure of the smallest angle is 50° less than that of the largest angle, then find the largest angle (in degrees).

SSC CGL 20/08/2021 (Shift-02)

(a) 80° (b) 85°
(c) 90° (d) 75°

20. Of the three angles of a triangle, one is twice the smallest and another one is thrice the smallest. Find the value of the smallest angle.

SSC CPO 28/06/2024 (Shift-01)

(a) 65° (b) 30°
(c) 60° (d) 45°

21. The measures of two angles of a triangle are in the ratio 3:7. If the sum of these two measurements is equal to the measure of the third angle, find the smallest angle.

SSC CHSL TIER-II 10/01/2024

(a) 9° (b) 3°
(c) 36° (d) 27°

22. The measures of the three angles of a triangle are such that the smallest angle measures 42° less than the greatest angle, while the measure of the remaining angle is 24° more than the measure of the smallest angle. measure of the smallest angle of the trianlge.

SSC CHSL 04/07/2024 (Shift-02)

(a) 42° (b) 40°
(c) 38° (d) 36°

23. In ΔABC, DE || BC in such a way that A-D-B and A-E-C. If ∠ACB = 40°, then ∠DAE + ∠ADE = _______.

SSC CPO 09/11/2022 (Shift-01)

(a) 240° (b) 120°
(c) 140° (d) 230°

24. In a ΔPQR, ∠P = 90°, ∠R = 47° and PS ⊥ QR. Find the value of ∠QPS.

SSC CPO 04/10/2023 (Shift-03)

(a) 45° (b) 40°
(c) 43° (d) 47°

25. In a ΔABC, AB = AC and ∠A = 80°, then find ∠B.

SSC CGL 11/09/2024 (Shift-02)

(a) 50° (b) 80°
(c) 40° (d) 45°

26. In a ΔLMN, ∠L = 118° and LM = LN. Find ∠N.

SSC CGL 11/09/2024 (Shift-03)

(a) 42° (b) 31°
(c) 65° (d) 62°

27. In ΔABC, AB = AC and ∠A = 70°. Find the value of ∠C.

SSC CPO 29/06/2024 (Shift-01)

(a) 45° (b) 75°
(c) 65° (d) 55°

28. In ΔXYZ, A is a point on YZ such that XA = YA. If ∠XYA = 50° and ∠AXZ = 19°, what is the degree measure of ∠XZA?

SSC CGL 26/09/2024 (Shift-03)

(a) 61° (b) 53°
(c) 49° (d) 41°

29. In ΔPQR, PQ = PR and S is a point on QR such that ∠PSQ = 96° + ∠QPS and ∠QPR = 132°. What is the measure of ∠PSR?

SSC CGL Tier II 03/02/2022

(a) 45° (b) 56°
(c) 54° (d) 52°

30. In a ΔABC, points P, Q and R are taken on AB, BC and CA, respectively, such that BQ = PQ and QC = QR. If ∠BAC = 75°, what is the measure of ∠PQR (in degrees)?

SSC CGL 11/04/2022 (Shift-01)

(a) 40° (b) 30°
(c) 50° (d) 75°

31. In a ΔPQR, ∠P:∠Q:∠R = 3:4:8. The shortest side and the longest side of the triangle, respectively, are:

SSC CPO 04/10/2023 (Shift-02)

(a) QR and PR (b) PQ and PR
(c) PQ and QR (d) QR and PQ

32. If 45° and 65° are the angles of a triangle, then find the exterior angle of the third angle (remaining angle).

SSC CGL 10/09/2024 (Shift-02)

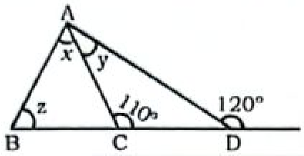
(a) 110° (b) 120°
(c) 70° (d) 100°

33. In ΔABC, side BC is produced to D such that ∠ACD = 127°. If ∠ABC = 35°, then find ∠BAC.

SSC CHSL 02/08/2023 (Shift-04)

(a) 82° (b) 92°
(c) 95° (d) 75°

34. From the following figure find $x + y + z$.



SSC CGL 01/12/2022 (Shift-03)

(a) 100° (b) 130°
(c) 120° (d) 110°

35. In ΔPQR, QR is produced to S. If ∠PRS = $(9x - 15)^\circ$, ∠RPQ = $(2x)^\circ$ and ∠PQR = $(4x + 15)^\circ$, what is the value of x?

SSC CHSL 03/08/2023 (Shift-03)

(a) 55 (b) 20
(c) 10 (d) 75

36. Side BC of a ΔABC is extended upto D such that CD = AC. If ∠BAD = 118° and ∠ACB = 80°, then the value of ∠ABC is equal to:

SSC CHSL 08/07/2024 (Shift-05)

(a) 36° (b) 32°
(c) 22° (d) 27°

37. The side BC of ΔABC is produced to a point D. If AC = BC and ∠BAC = 70°, then find the value of ∠ACD – ∠ABC.

SSC CGL 25/09/2024 (Shift-01)

(a) 70° (b) 60°
(c) 75° (d) 45°

38. In a ΔABC, AB = AC. BC is extended to D such that CD = AB and ∠ADC is 30°. What are the angles of ΔABC?

SSC CHSL 04/07/2024 (Shift-04)

(a) 30°, 60°, 90°
(b) 50°, 60°, 70°
(c) 60°, 60°, 60°
(d) 45°, 60°, 75°

39. The side PR of a ΔPQR is extended to S such that QR = RS. If ∠PRQ = 86°, then find the value of ∠PSQ.

SSC CPO 29/06/2024 (Shift-03)

(a) 94° (b) 54°
(c) 43° (d) 86°

40. In a ΔABC, BD is perpendicular to AC. E is point on BC such that ∠BEA = $x°$. If ∠EAC = 38° and ∠EBD = 40°, then the value of x is:

SSC CHSL 05/07/2024 (Shift-03)

(a) 82 (b) 88
(c) 96 (d) 48

41. In ΔPQR, QT is perpendicular to PR and S is a point on QR such that ∠PSQ = p°. If ∠TQR = 46° and ∠SPR = 32°, then the value of p is:

SSC CGL 10/06/2019 (Shift-01)

(a) 78° (b) 82°
(c) 76° (d) 72°

42. In ΔABC, BD ⊥ AC at D. E is a point on BC such that ∠BEA = $x°$. If ∠EAC = 46° and ∠EBD = 60° then the value of x is:

SSC CPO 23/11/2020 (Shift-01)

(a) 76° (b) 68°
(c) 78° (d) 72°

43. In ΔABC, D is a point on BC such that ∠BAD = 1/2 ∠ADC and ∠BAC = 77° and ∠C = 45°. What is the measure of ∠ADB?

SSC CGL 23/08/2021 (Shift-02)

(a) 64° (b) 77°
(c) 45° (d) 58°

44. In ΔPQR, S is a point on the side QR such that ∠QPS = $\frac{1}{2}$∠PSR, ∠QPR = 78° and ∠PRS = 44°. What is the measure of ∠PSQ?

SSC CGL Tier II 29/01/2022

(a) 68° (b) 64°
(c) 58° (d) 56°

45. In ΔABC, D is a point on BC such that ∠ADB = 2∠DAC, ∠BAC = 70° and ∠B = 56°. What is the measure of ∠ADC?

SSC CGL Tier II 03/02/2022

(a) 72° (b) 54°
(c) 74° (d) 81°

46. The side BC of a ΔABC is extended to a point D. If ∠ACD = 117° and ∠ABC = $\frac{5}{8}$∠BAC, then what is the measure of ∠ABC?

SSC CHSL 13/04/2021 (Shift-03)

(a) 72° (b) 45°
(c) 54° (d) 36°

47. The side BC of ΔABC is produced to a point D. If AC = BC and ∠BAC = 70°, then find the value of 2.5∠ACD – 1.5∠ABC.

SSC CGL 26/09/2024 (Shift-02)

(a) 245° (b) 235°
(c) 225° (d) 230°

48. PQR is a triangle. The bisectors of the internal angle ∠Q and external angle ∠R intersect at S. If ∠QSR = 40°, then ∠P is:

SSC CPO 04/10/2023 (Shift-01)

(a) 80° (b) 60°
(c) 40° (d) 30°

49. In ΔABC, M and N are the points on the side BC such that AM ⊥ BC, AN is the bisector of ∠A and M lies between B and N. If ∠B = 68°, ∠C = 26°, then the measure of ∠MAN is ?

SSC CGL TIER-II (16/11/2020)

(a) 24° (b) 22°
(c) 28° (d) 21°

50. In ΔABC, AD is perpendicular to BC and AE is the bisector of ∠BAC. If ∠ABC = 58° and ∠ACB = 34°, then find the measure of ∠DAE?

SSC CGL 12/04/2022 (Shift-03)

(a) 12° (b) 11°
(c) 22° (d) 15°

51. In ΔABC, AD ⊥ BC at D and AE is the bisector of ∠A. If ∠B = 62° and ∠C = 36°, then what is the measure of ∠DAE?

SSC CGL 17/08/2021 (Shift-02)

(a) 13° (b) 54°
(c) 23° (d) 27°

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52. In ΔPQR, $\angle Q = 84°$, $\angle R = 48°$ $PS \perp QR$ at S and the bisector of $\angle P$ meets QR at T. What is the measure of $\angle SPT$?

SSC CGL TIER-II 15/11/2020

(a) 21° (b) 12°
(c) 24° (d) 18°

53. In ΔABC, $\angle B = 78°$, AD is a bisector of $\angle A$ meeting BC at D, and $AE \perp BC$ at E. If $\angle DAE = 24°$, then the measure of $\angle ACB$ is:

SSC CGL Tier II 29/01/2022

(a) 38° (b) 30°
(c) 32° (d) 42°

54. Select the correct statement about the properties of a triangle.

SSC Phase-XII 24/06/2024 (Shift-03)

(a) The sum of two sides may be equal to the third side.
(b) The sum of two sides is always equal to the third side.
(c) The sum of two sides is always greater than the third side
(d) The sum of two sides is always less than the third side.

55. The sum of any two sides of a triangle is:

SSC CPO 28/06/2024 (Shift-03)

(a) less than or equal to third side
(b) equal to third side
(c) greater than the third side
(d) less than the third side

56. Which option with given sides forms a Triangle?

SSC CHSL 03/08/2023 (Shift-02)

(a) 8, 6, 9 (b) 100, 200, 300
(c) 10, 25, 11 (d) 8, 2, 6

57. The three sides of a triangle are 9, 24 and S units. Which of the following is correct?

SSC CHSL 02/08/2023 (Shift-01)

(a) $15 < S < 33$ (b) $15 \le S < 33$
(c) $15 < S \le 33$ (d) $15 \le S \le 33$

58. If the three sides of a triangle are 12, 22 and m units, then which of the following is correct?

SSC CPO 28/06/2024 (Shift-02)

(a) $10 \le m \le 34$ (b) $10 < m < 34$
(c) $10 \le m < 34$ (d) $10 < m \le 34$

59. The lengths of the three sides of a triangle are 19 cm, 25 cm and y cm. Which of the following options most accurately gives the possible values of 'y'?

SSC CHSL 09/07/2024 (Shift-04)

(a) $6 \le y \le 44$ (b) $6 < y \le 44$
(c) $6 \le y < 44$ (d) $6 < y < 44$

60. The three sides of a triangle are 12, 17 and x units. Which of the following options is correct?

SSC CGL 20/07/2023 (Shift-03)

(a) $5 < x < 29$ (b) $5 \le x < 29$
(c) $5 \le x \le 29$ (d) $5 < x \le 29$

61. In ΔABC, AB = 9 cm and AC = 13 cm, then the length of BC could be:

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 20 cm (b) 22 cm
(c) 4 cm (d) 2 cm

62. In a triangle, the lengths of sides are 6 units, 12 units and x units. How many possible integer values are there for x?

SSC CGL 17/09/2024 (Shift-03)

(a) 9 (b) 12
(c) 11 (d) 10

63. If the sides of a triangle are 7, 12 and x, and x is an integer, then find the number of possible values of x.

SSC CPO 28/06/2024 (Shift-02)

(a) 14 (b) 13
(c) 15 (d) 12

64. If 6, 18, x are sides of a triangle and x is an integer, then the number of possible values of x is:

SSC CHSL 03/07/2024 (Shift-03)

(a) 11 (b) 15
(c) 13 (d) 14

65. In a ΔABC, AB = 6 cm, BC = 11 cm. How many integral values of AC can be possible ?

SSC CHSL 10/03/2023 (Shift-02)

(a) 10 (b) 8
(c) 12 (d) 11

66. If a triangle has a perimeter of 52 units, then all its sides have length ________ units.

SSC CGL 17/09/2024 (Shift-03)

(a) <26 (b) <20
(c) <24 (d) <18

67. The perimeter of a triangle with sides of integer values is equal to 13. How many such triangles are possible?

SSC CGL 05/12/2022 (Shift-03)

(a) 5 (b) 8
(c) 7 (d) 6

68. Taking any three of the line segments out of segments of length 2 cm, 5 cm, 7 cm and 8 cm, the number of triangles that can be formed is:

SSC CPO 29/06/2024 (Shift-02)

(a) 2 (b) 4
(c) 1 (d) 3

69. The lengths of the two sides of a triangle are 14 cm and 9 cm. Which of the options below can be the length of the third side?

SSC CHSL 09/08/2023 (Shift-03)

(a) 17 cm (b) 23 cm
(c) 24 cm (d) 5 cm

70. How many triangles can be formed by taking any three from the four line segments of lengths, 2 cm, 3 cm, 5 cm and 6 cm?

SSC CGL 06/03/2020 (Shift-02)

(a) 1 (b) 2
(c) 3 (d) 4

71. In ΔABC, the length of side BC is 2 cm less than twice the length of side AB. The length of side AC exceeds the length of side AB by 10 cm. The perimeter of the triangle is 40 cm. Determine the length (in cm) of the smallest side of the triangle.

SSC CGL 12/09/2024 (Shift-02)

(a) 12 (b) 14
(c) 10 (d) 8

72. If three angles of a triangle are $(18x + 6°)$, $(10x + 30°)$ and $(15x + 15°)$, then the triangle is:

SSC Phase-XII 25/06/2024 (Shift-03)

(a) scalene (b) equilateral
(c) right angled (d) isosceles

73. Which of the following statements is/are correct?

A. A triangle can have all angles less than 60°
B. A triangle can have one obtuse angle.
C. A triangle can have two right angles.
D. A triangle can have two acute angles.

SSC CPO 28/06/2024 (Shift-01)

(a) B (b) B and D
(c) A and C (d) A

74. X, Y, and Z are three points on a plane with XY = 11 cm, YZ = 13 cm, and XZ = 24 cm. The number of circles that travel through points X, Y and Z is:

SSC CGL 10/09/2024 (Shift-01)

(a) 4 (b) 0
(c) 1 (d) 3

75. If in ΔPQR, $\angle P = 120°$, $PS \perp QR$ at S and PQ + QS = SR, then the measure of $\angle Q$ is-

SSC CGL TIER-II 13/09/2019

(a) 20° (b) 50°
(c) 40° (d) 30°

◆ TYPE – II ◆
CONGRUENCY & SIMILARITY

76. Which of the following statements is sufficient to conclude that two triangles are congruent?

SSC CGL 09/09/2024 (Shift-01)

(a) These have two equal sides and the same perimeter.
(b) These have the same area and the same base.
(c) One side and one angle of both triangles are unequal.
(d) These have the same base and the same height.

77. By applying which of the following criteria can two triangles NOT be proved congruent?

SSC CGL 10/09/2024 (Shift-01)

(a) angle-side-angle
(b) angle-angle-angle
(c) side-side-side
(d) side-angle-side

78. Which of the following is not a criterion of congruent triangles?

SSC Phase-XII 24/06/2024 (Shift-03)

(a) Side-Angle-Side
(b) Angle-Angle-Angle
(c) Angle-Side-Angle
(d) Side-Side-Side

79. Which of the following statements is FALSE?

SSC CGL 21/07/2023 (Shift-04)

(a) Two triangles are congruent if the size and shape of the triangles may or may not be equal.

(b) SAS and SSS are both conditions of congruency of triangles

(c) If two angles and the included side of one triangle is equal to two angles and the included side of other triangle, then the triangles are congruent

(d) If two triangles are congruent, then one of them can be superimposed on the other triangle

80. For congruent triangles ΔABC and ΔDEF, which of the following statement is correct?

SSC CGL 26/07/2023 (Shift-02)

(a) Perimeter of ΔABC = $\frac{1}{2}$ Perimeter of ΔDEF

(b) Perimeter of ΔABC = Perimeter of ΔDEF

(c) Perimeter of ΔABC < Perimeter of ΔDEF

(d) Perimeter of ΔABC > Perimeter of ΔDEF

81. In ΔABC and ΔPQR, AB = 7m, BC = 8 m, AC = 9 m, PQ = 7 m, QR = 8 m and PR = 9 m. Which of the following is true for these triangles?

SSC Phase-XII 21/06/2024 (Shift-03)

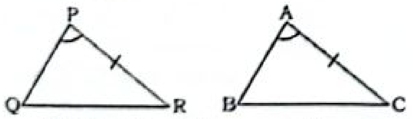
(a) ΔABC ≅ ΔQRP

(b) ΔABC ≅ ΔRQP

(c) ΔCBA ≅ ΔPQR

(d) ΔABC ≅ ΔPQR

82. In the following figure, ∠A = ∠P and AC = PR.



Which of the following options needs to be satisfied for ΔPQR and ΔABC to be congruent?

SSC Phase-XII 26/06/2024 (Shift-04)

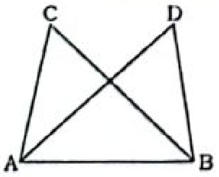
(a) BC = QR by SSA criteria

(b) BC = QR by ASS criteria

(c) AB = PQ by SSA criteria

(d) AB = PQ by SAS criteria

83. ΔABC and ΔABD are on a common base AB and AC = BD and BC = AD as shown in the given figure.



Which of the following options is true?

SSC Phase-XII 25/06/2024 (Shift-04)

(a) ΔABC ≅ ΔADB

(b) ΔABC ≅ ΔBAD

(c) There are no congruent triangles in the given figure

(d) ΔABC ≅ ΔABD

84. The points P and S are on the same side of the line segment QR, such that ∠PQR = 90°, ∠SRQ = 90°and PQ = SR. Select the correct statement.

SSC CGL 09/09/2024 (Shift-02)

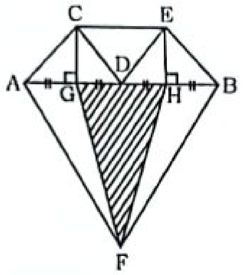
(a) ΔPQR ≅ ΔSRQ by RHS

(b) ΔPQR ≅ ΔSQR by SAS

(c) ΔPQR ≅ ΔSQR by RHS

(d) ΔPQR ≅ ΔSRQ by SAS

85. In the diagram, if $\overline{AB} \| \overline{CE}$, AG = DH = HB, then which of the following is correct?



I. ΔACG ≅ ΔBEH

II. ΔCDE ≅ ΔDEB ≅ ΔDCA

III. ΔHFB ≅ ΔAFG

SSC CHSL 09/07/2024 (Shift-04)

(a) I and III
(b) I and II
(c) I, II and III
(d) Only I

86. Two ΔEFG and ΔHIJ are congruent. If the area of ΔEFG is 124 cm^2, then the area of ΔHIJ will be:

SSC CGL 09/09/2024 (Shift-03)

(a) 124 cm^2
(b) 248 cm^2
(c) 62 cm^2
(d) 31 cm^2

87. ΔPQR and ΔABC are two congruent triangles. If the area of ΔPQR is 225 cm^2, then the area of ΔABC is:

SSC Phase-XII 25/06/2024 (Shift-03)

(a) 225 cm^2
(b) 25 cm^2
(c) 112.5 cm^2
(d) 15 cm^2

88. ΔABC and ΔRPQ are congruent, then the side of ΔABC that corresponds to PQ is:

SSC CGL 11/09/2024 (Shift-02)

(a) AB
(b) CA
(c) AR
(d) BC

89. In ΔABC and ΔDEF, AB = FD and ∠A = ∠D. The two triangles are congruent by SAS criterion if:

SSC CGL 12/09/2024 (Shift-01)

(a) BC = DE
(b) AC = EF
(c) BC = EF
(d) AC = DE

90. ΔLON and ΔLMN are two right-angled triangles with common hypotenuse LN such that ∠LON = 90° and ∠LMN = 90°. LN is the bisector of ∠OLM. If LN = 29 cm and ON = 20 cm, then what is the perimeter (in cm) of ΔLMN?

SSC CHSL 08/08/2023 (Shift-03)

(a) 67
(b) 62
(c) 65
(d) 70

91. If ΔPQR ≅ ΔABC, AB = 6 cm, ∠B = 50° and ∠A = 70°, then which of the following is true?

SSC CGL 13/09/2024 (Shift-01)

(a) QR = 6 cm, ∠Q = 60°

(b) QR = 6 cm, ∠R = 60°

(c) QP = 6 cm, ∠P = 60°

(d) QP = 6 cm, ∠R = 60°

92. If ΔBPQ ≅ ΔASR and ∠A = $\frac{1}{3}$ ∠R = ∠S, then find ∠Q. (All angles are in degrees).

SSC CGL 03/12/2022 (Shift-04)

(a) 108°
(b) 36°
(c) 72°
(d) 118°

93. If ΔABC and ΔQPR are congruent triangles such that AB = 7cm, AC = 8 cm, ∠B = 65° and ∠C = 75°, then which of the following is true?

SSC CGL 18/09/2024 (Shift-01)

(a) ∠R = 75° and PQ = 8 cm

(b) ∠R = 75° and PQ = 7 cm

(c) ∠Q = 40° and RQ = 7 cm

(d) ∠P = 65° and AC = PR

94. ΔABC and ΔDEF are two triangles such that ΔABC ≅ ΔFDE. If AB = 17 cm, ∠B = 52° and ∠A = 95°, then which of the following options is true?

SSC CGL 19/09/2024 (Shift-02)

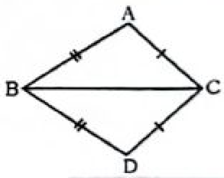
(a) DE = 17 cm, ∠F = 33°

(b) DF = 17 cm, ∠E = 33°

(c) DE = 17 cm, ∠E = 33°

(d) DF = 17 cm, ∠D = 33°

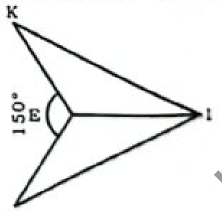
95. In the given figure, AB=DB and AC = DC. If ∠ABD = 58° and ∠DBC = (2x – 4)°, ∠ACB = (y + 15)° and ∠DCB = 63°, then the value of 2x + 5y is:



SSC CGL 02/12/2022 (Shift-04)

(a) 325
(b) 273
(c) 259
(d) 268

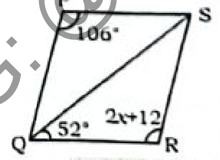
96. In the given figure, if KI = IT and EK = ET, then ∠TEI = ____.



SSC CGL 13/12/2022 (Shift-04)

(a) 75°
(b) 125°
(c) 105°
(d) 150°

97. In the given figure, ΔQPS ≅ ΔSRQ. Find the measure of ∠PSR.



SSC CGL 21/07/2023 (Shift-01)

(a) 64°
(b) 74°
(c) 52°
(d) 82°

98. ΔABC and ΔPQR are respectively congruent. If AB = 8 =PQ, BC = 10 = QR and ∠B = 35°, then what is the value of ∠P + ∠C?

SSC CGL 24/09/2024 (Shift-01)

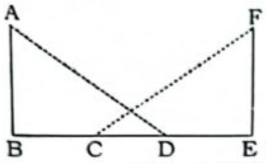
(a) 145°
(b) 130°
(c) 160°
(d) 120°

99. If $\Delta PQR \cong \Delta MON$ such that $\angle PQR = 82°$, $\angle QRP = 47°$, $\angle RPQ = 51°$, $\angle MON = (5y - 8)°$, $QR = 24$ and $ON = 3x + y$, then find $(x + y)$.

SSC CGL 10/09/2024 (Shift-03)

(a) 14 (b) 18
(c) 16 (d) 20

100. In ΔABD and ΔFEC, $\angle BAD = 60°$, $l(BD) = l(EC)$, $\angle ABD = \angle FEC = 90°$, and $l(AB) = l(FE)$. Find the ratio of $\frac{\angle BAD}{\angle FCE}$.



SSC CGL 12/09/2024 (Shift-03)

(a) 2 : 3 (b) 1 : 2
(c) 2 : 5 (d) 2 : 1

101. In ΔDEF, $DE = 12$ cm, $EF = 15$ cm, and $\angle DEF = 90°$. ΔDEF is congruent to ΔXYZ. If $YZ = 15$ cm, then what is the length of XZ?

SSC CGL 24/09/2024 (Shift-02)

(a) $3\sqrt{41}$ cm (b) $2\sqrt{41}$ cm
(c) $5\sqrt{41}$ cm (d) $4\sqrt{41}$ cm

102. Let ΔABC and ΔPQR be two congruent triangles, such that $\angle A = \angle P = 90°$. If $BC = 29$ cm, $PR = 21$ cm, find the value (in cm) of AB.

SSC CHSL TIER-II 02/11/2023

(a) 22 (b) 20
(c) 23 (d) 19

103. Let ΔABC, ΔPQR be two congruent triangles such that $\angle A = \angle P = 90°$. If $BC = 17$ cm, $PR = 8$ cm, find AB (in cm).

SSC CPO 04/10/2023 (Shift-02)

(a) 9 (b) 14
(c) 12 (d) 15

104. In ΔRST, Z is a point on side ST and $SZ = ZT$. If $\angle RZS = 90°$ and $RS = 10$ cm, then what is the value of RT ?

SSC CHSL 09/03/2023 (Shift-04)

(a) 15 cm (b) 10 cm
(c) 8 cm (d) 12 cm

105. Let, D and E be two points on the side BC of ΔABC such that $AD = AE$ and $\angle BAD = \angle EAC$, If $AB = (3x + 1)$ cm, $BD = 9$ cm, $AC = 34$ cm and $EC = (y + 1)$ cm, then the value of $(x + y)$ is:

SSC CGL TIER-II 16/11/2020

(a) 17 (b) 20
(c) 19 (d) 16

106. In ΔABC, M is the midpoint of the side AB. N is a point in the interior of ΔABC such that CN is the bisector of $\angle C$ and $CN \perp NB$. What is the length (in cm) of MN, if $BC = 10$ cm and $AC = 15$ cm?

SSC CGL TIER-II 29/01/2022

(a) 2.5 (b) 2
(c) 5 (d) 4

107. The sides ST and TR and the median SU of the ΔSTR are equal to the sides MN and NJ and the median MV of the ΔMNJ, respectively. If $\angle TSU = 46°$, $\angle NMJ = 79°$ and $\angle MVN = 88°$, what is the degree measure of $\frac{7}{11}\angle SRT$?

SSC CHSL 09/07/2024 (Shift-03)

(a) 35° (b) 55°
(c) 56° (d) 47°

108. Given that ΔMAN and ΔCPT are congruent to each other such that $\angle M = 75°$, $\angle N = 65°$, $\angle A = 40°$, $\angle C = \frac{x}{2}$, $\angle P = 6y + 16$. Find the value of $(x - 5y)$.

SSC Phase X 04/08/2022 (Shift-02)

(a) 125° (b) 120°
(c) 135° (d) 130°

109. If $\Delta ABC \cong \Delta PQR$ and $\angle ABC = (x + 60)°$, $\angle PQR = (85 - 4x)°$, and $\angle RPQ = (3x + 65)°$, then the value of $\angle ABC$ in degree is:

SSC CGL 13/12/2022 (Shift-03)

(a) 15 (b) 5
(c) 45 (d) 65

110. In ΔABC, AP, the bisector of $\angle A$, is perpendicular to BC at point P. The measures of BP and PC are x and $3y$ respectively. The measures of AB and AC are $4x$ and $(5y + 21)$. What is the value of $(x + y)$?

SSC CHSL 08/08/2023 (Shift-04)

(a) 21 (b) 15
(c) 12 (d) 18

111. Let ABC be a triangle. If the mid-points of AB, BC and AC are D, E and F, respectively, then ΔDEF is NOT congruent to _____.

SSC CGL 24/09/2024 (Shift-03)

(a) ΔBDE (b) ΔECF
(c) ΔADF (d) ΔABC

112. In a ΔABC, if $\angle A = 90°$, $AC = 5$cm $BC = 9$ cm and in ΔPQR, $\angle P = 90°$, $PR = 3$ cm, $QR = 8$ cm, then:

SSC CGL 18/07/2023 (Shift-04)

(a) $\Delta ABC \cong \Delta PQR$
(b) $\Delta ABC \ncong \Delta PQR$
(c) $\Delta ABC \neq \Delta PQR$
(d) $\Delta ABC = \Delta PQR$

113. In ΔPQR, $PQ = QR$ and O is an interior point of ΔPQR such that $\angle OPR = \angle ORP$.

Consider the following statements:

(i) ΔPOR is an isosceles triangle.
(ii) O is the centroid of ΔPQR.
(iii) ΔPQO is congruent to ΔRQO.

Which of the above statements are correct?

SSC CGL TIER-II 02/03/2023

(a) Only (i) and (ii)
(b) Only (i) and (iii)
(c) Only (ii) and (iii)
(d) Only (ii)

114. In a parallelogram ABCD, if vertices are in respective order and diagonals AC and BD intersect at O, then which of the following is NOT always correct?

SSC Phase-XII 21/06/2024 (Shift-02)

(a) $\Delta BOC \cong \Delta AOD$
(b) $\Delta ABC \cong \Delta ADC$
(c) $\Delta AOD \cong \Delta COD$
(d) $\Delta AOB \cong \Delta COD$

115. In a ΔABC, P and Q are two points on AB and AC, respectively, such that PQ parallel to BC. If $AC = 5QC$, then the ratio $PQ : BC$ is equal to:

SSC CHSL 08/07/2024 (Shift-03)

(a) 4 : 3 (b) 4 : 5
(c) 5 : 4 (d) 3 : 4

116. In ΔABC, $DE \| BC$ and $5AE = 3\ EC$. If $AB = 6.4$ units, then the value of DB (in units) is:

SSC CGL 26/09/2024 (Shift-02)

(a) 2.4 (b) 5
(c) 3.2 (d) 4

117. In ΔPQR, $PR = 10$ cm. Find the length of PT, where $ST \| QR$. Given that $PS = 6$ cm and $QS = 14$ cm.

SSC CHSL 02/07/2024 (Shift-04)

(a) 2 cm (b) 4 cm
(c) 1.5 cm (d) 3 cm

118. In a ΔABC, D and E are two points on sides AB and AC, respectively, such that DE is parallel to BC and $AD : DB = 3 : 5$. If $AC = 5.6$ cm, then find the value (in cm) of AE.

SSC CHSL 08/07/2024 (Shift-01)

(a) 1.9 (b) 2.1
(c) 2.5 (d) 2.3

119. In ΔDEW, $AB \| EW$. If $AD = 4$ cm, $DE = 12$ cm and $DW = 24$ cm, then find the length of DB.

SSC CHSL 11/07/2024 (Shift-02)

(a) 8 cm (b) 9 cm
(c) 7 cm (d) 6 cm

120. For a ΔABC, D and E are two points on AB and AC such that $AD = \frac{1}{6}AB$, $AE = \frac{1}{6}AC$. If $BC = 22$cm then DE is (Consider up to two decimals)

SSC CPO 03/10/2023 (Shift-02)

(a) 3.67 cm (b) 1.67 cm
(c) 1.33 cm (d) 3.33 cm

121. In a ΔLMN, OP is a line segment drawn parallel to the side MN. OP intersects the sides LM and LN at O and P, respectively. If $LM = 15$ cm, $OM = 4$ cm, and $PN = 5$ cm, then what is the length (in cm) of the side LN?

SSC CPO 04/10/2023 (Shift-03)

(a) 20.25 (b) 16.25
(c) 18.75 (d) 22.75

122. In ΔPMN, S is a point on PM in the ratio of 5 : 7. The line segment ST is parallel to MN. If $MN = 24$ cm, then what is the length (in cm) of segment ST?

SSC CHSL 11/08/2023 (Shift-04)

(a) 16 (b) 17
(c) 14 (d) 10

123. In ΔABC, a line is drawn parallel to BC, intersecting sides AB and AC at Points S and T, where AB = 8.3 cm, BC = 16.6 cm and BS = 5.3 cm. What is the length of ST (in cm)?

SSC Phase-XI 30/06/2023 (Shift-01)

(a) 6 (b) 12
(c) 24 (d) 18

124. In ΔXYZ, P and Q are the points on sides XY and XZ respectively. PQ is parallel to YZ and PQ : YZ = 3 : 8. If XY = 88 cm, then what is the length of XP?

SSC CHSL 10/03/2023 (Shift-01)

(a) 24 cm (b) 21 cm
(c) 33 cm (d) 28 cm

125. In a ΔPQR, AB is drawn parallel to QR, cutting sides at A and B where length of PQ = 6cm, length of QR = 8cm and length of QA = 3cm. What is the length of AB?

SSC CGL 08/12/2022 (Shift-04)

(a) 4.0 cm (b) 4.2 cm
(c) 5.0 cm (d) 2.4 cm

126. In ΔDEF, M and N are the points on sides DE and DF respectively. MN is parallel to EF and MN : EF = 2 : 5. If DE = 60 cm., then what is the length of ME?

SSC CHSL 09/03/2023 (Shift-03)

(a) 48 cm (b) 24 cm
(c) 54 cm (d) 36 cm

127. In ΔPQR, ∠Q = 85° and ∠R = 65°. Points S and T are on the sides PQ and PR respectively such that ∠STR = 95°, then the ratio of QR and ST is 9 : 5. If PQ = 21.6 cm, then the length of PT is :

SSC CGL 04/03/2020 (Shift-02)

(a) 10.5 cm (b) 9.6 cm
(c) 12 cm (d) 9 cm

128. In ΔABC, XY is drawn parallel to BC, cutting sides at X and Y, where AB = 5.4 cm, BC = 7.2 cm and BX = 3 cm. What is the length of XY (in cm)?

SSC CHSL 02/07/2024 (Shift-01)

(a) 4.3 (b) 3.0
(c) 3.2 (d) 2.8

129. In ΔABC, ∠B = 87° and ∠C = 60°. Points D and E are on the sides AB and AC, respectively, such that ∠DEC = 93° and DE : BC = 5 : 9. If AB = 14.4 cm, then the length of AE is:

SSC PHASE-IX 2022

(a) 7.2 cm (b) 9 cm
(c) 8 cm (d) 8.4 cm

130. In ΔABC, P and Q are points on AB and BC, respectively, such that PQ || AC. Given that AB = 26, PQ = 7 and AC = 10 find the value of AP.

SSC CGL 08/12/2022 (Shift-01)

(a) 7.1 (b) 7.8
(c) 18.2 (d) 16.4

131. R and S are the mid points of the sides XY and XZ, respectively, of ΔXYZ. Also, XR = 15 cm, XY = 25 cm, XS = 12 cm and XZ = 20 cm. RS is equal to:

SSC Phase-XI 27/06/2023 (Shift-04)

(a) $\frac{2}{5}$YZ (b) $\frac{5}{3}$YZ
(c) $\frac{3}{5}$YZ (d) $\frac{3}{4}$YZ

132. In ΔABC, D and E are points on sides AB and AC, such that DE || BC. If AD = x + 3, DB = 2x – 3, AE = x + 1 and EC = 2x – 2, then the value of x is:

SSC CGL 12/12/2022 (Shift-01)

(a) $\frac{4}{5}$ (b) $\frac{1}{2}$
(c) $\frac{3}{5}$ (d) $\frac{1}{5}$

133. In ΔABC, D and E are the points on sides AB and AC, respectively, such that DE||BC. If AD = x, DB = x – 2, AE = x + 2, and EC = x – 1, then AB+EC is equal to (all measurements in cm):

SSC PHASE-IX 2022

(a) 9 (b) 10
(c) 12 (d) 8

134. In ΔABC, D and E are points on the sides BC and AB, respectively, such that ∠ACB = ∠DEB. If AB = 12 cm, BE = 5 cm and BD : CD = 1:2, then BC is equal to:

SSC CGL Tier II 03/02/2022

(a) 8√3 cm (b) 5√5 cm
(c) 6√5 cm (d) 6√3 cm

135. In a ΔABC, DE is parallel to BC, AD = a, DB = a + 4, AE = 2a + 3, EC = 7a. What is the value of 'a' if a > 0?

SSC CGL 06/03/2020 (Shift-03)

(a) 3 (b) 5
(c) 6 (d) 4

136. In ΔABC, D and E are points on sides AB and AC, such that DE|| BC. If AD = x, DB = x – 3, AE = x + 3 and EC = x – 2, then the value of x is:

SSC CHSL 11/07/2024 (Shift-04)

(a) 5.2 (b) 4.0
(c) 4.5 (d) 4.2

137. In ΔABC the straight line parallel to the side BC meets AB and AC at the points P and Q, respectively. If AP = QC, the length of AB is 12 cm and the length of AQ is 2 cm, then the length (in cm) of CQ is:

SSC CHSL 02/07/2024 (Shift-04)

(a) 6 (b) 4
(c) 3 (d) 2

138. In ΔABC, a straight line parallel to the side BC meets AB and AC at the points P and Q, respectively. If AP = QC, the length of AB is 16 cm and the length of AQ is 4 cm, then the length of (in cm) CQ is:

SSC CHSL 02/08/2023 (Shift-02)

(a) $(2\sqrt{21}+2)$ (b) $(2\sqrt{18}-2)$
(c) $(2\sqrt{17}-2)$ (d) $(2\sqrt{19}+2)$

139. In a ΔABC, AB = 6 units, BC = 8 units and AC = 10 units. Let M be a point on AC such that BM = 5 units. With a point D, a ΔBMD is formed and the ΔBMD is similar to the ΔABC with $\frac{BM}{AB} = \frac{BD}{AC}$. What is the lenght of BD in units?

SSC CHSL 01/07/2024 (Shift-03)

(a) $\frac{35}{3}$ (b) $\frac{40}{3}$
(c) $\frac{25}{3}$ (d) $\frac{10}{3}$

140. PQR is a triangle. MN is a line segment intersecting PQ in M and PR in N such that MN || QR and divides ΔPQR into two parts, which are equal in area. What is the ratio of MQ to PQ?

SSC CHSL 11/07/2024 (Shift-01)

(a) $1:\sqrt{2}$ (b) $\sqrt{2}:1$
(c) $\sqrt{2}:(\sqrt{2}-1)$ (d) $(\sqrt{2}:-1):\sqrt{2}$

141. In ΔPQR, S and T are points on PQ and PR, respectively, such that ST || QR and ST divides the ΔPQR into two parts of equal areas. Then the ratio of PS and QS is:

SSC CHSL 03/07/2024 (Shift-01)

(a) $1:\sqrt{2}-1$ (b) 1 : 1
(c) $1:\sqrt{2}+1$ (d) $1:\sqrt{2}$

142. In ΔRST, M and N are two points on RS and RT such that MN is parallel to the base ST of the ΔRST. If RM = $\frac{1}{3}$MS, and ST = 5.6 cm, what is the ratio of $\frac{\text{Area of Triangle RMN}}{\text{Area of Trapezium MNTS}}$?

SSC CHSL 04/08/2023 (Shift-01)

(a) $\frac{14}{15}$ (b) $\frac{15}{16}$
(c) $\frac{1}{15}$ (d) $\frac{1}{16}$

143. In ΔABC, X and Y are the points on sides AB and AC, respectively, such that XY is parallel to BC. If XY : BC = 2.5 : 7, what is the ratio of the area of the trapezium BCYX to that of the ΔAXY?

SSC CGL 20/04/2022 (Shift-02)

(a) $\frac{196}{25}$ (b) $\frac{25}{196}$
(c) $\frac{171}{25}$ (d) $\frac{25}{171}$

144. In ΔEFG, XY || FG, area of the quadrilateral XFGY = 44 m². If EX : XF = 2 : 3, then find the area of ΔEXY (in m²).

SSC CHSL 02/07/2024 (Shift-04)

(a) 8.38 (b) 9.46
(c) 7.28 (d) 8.10

145. ΔABC is an equilateral triangle. D and E are points on AB and AC respectively such that DE is parallel to BC and is equal to half the length of BC. If AD + CE + BC = 30 cm, then find the perimeter (in cm) of the quadrilateral BCED.

SSC CGL 20/08/2021 (Shift-01)

(a) 45 (b) 25

(c) 37.5 (d) 35

146. Two triangles ΔMNO and ΔXYZ are given similar with the ratio of their side as 9 : 4. If the area of the larger triangle is 243 sq.cm, then the area of smaller triangle will be:

SSC CHSL 02/08/2023 (Shift-03)

(a) 162 cm^2 (b) 28 cm^2

(c) 48 cm^2 (d) 16 cm^2

147. ΔXYZ and ΔPQR are similar. XY : PQ = 6 : 1. The area of ΔPQR is 6 cm^2. What is the area of ΔXYZ?

SSC CHSL TIER-II 26/06/2023

(a) 216 cm^2 (b) 261 cm^2

(c) 36 cm^2 (d) 6 cm^2

148. In ΔABC, D is a point on BC such that BD : DC = 3 : 4. E is a point on AD such that AE : ED = 2 : 3. Find the ratio area (ΔECD) : area (ΔAEB).

SSC CGL 17/08/2021 (Shift-03)

(a) 9 : 8 (b) 1 : 2

(c) 2 : 1 (d) 8 : 8

149. Given that the perimeters of two similar triangles, ΔABC and ΔDEF, are 24 cm and 9 cm, respectively, and DE = 3cm, what is the ratio between the area of ΔABC and that of ΔDEF?

SSC CHSL 01/07/2024 (Shift-01)

(a) 64 : 9 (b) 54 : 9

(c) 64 : 7 (d) 54 : 7

150. D and E are points on the sides AB and AC, respectively, of ΔABC such that DE is parallel to BC and AD : DB = 7 : 9. If CD and BE intersect each other at F, then find the ratio of areas of ΔDEF and ΔCBF.

SSC CGL 18/07/2023 (Shift-03)

(a) 49 : 144 (b) 49 : 81

(c) 49 : 256 (d) 256 : 49

151. Two similar triangles have area 490 sq. cm. and 640 sq. cm. If the length of the one side of the first triangle is 21cm, then what is the length of the corresponding side of the second triangle?

SSC CHSL 05/07/2024 (Shift-04)

(a) 24 cm (b) 16 cm

(c) 14 cm (d) 21 cm

152. The areas of two similar triangles ABC and PQR are 64 cm^2 and 144 cm^2, respectively. If the greatest side of the smaller ΔABC is 24 cm, then what is the greatest side of the bigger ΔPQR?

SSC CPO 09/11/2022 (Shift-02)

(a) 32 cm (b) 24 cm

(c) 42 cm (d) 36 cm

153. If the ratio of the areas of two similar triangles is 25 : 144, the ratio of their corresponding sides is:

SSC CGL 11/09/2024 (Shift-02)

(a) 5 : 12 (b) 5 : 144

(c) 25 : 12 (d) 12 : 5

154. If $\Delta ABC \sim \Delta QRP$; area of ΔABC : area of ΔPQR = 9 : 4 ; AB = 18 cm and BC = 15 cm, then find the length of PR.

SSC CHSL 02/07/2024 (Shift-03)

(a) 15 cm (b) 10 cm

(c) 12 cm (d) 14 cm

155. It is given that $\Delta ABC \sim \Delta XYZ$ and area ΔABC : area ΔXYZ = 81 : 25. If AB = 18cm, BC = 10 cm, CA = 15 cm, then what is the side XZ (in cm) ?

SSC PHASE-IX 2022

(a) $\frac{10}{3}$ (b) $\frac{25}{3}$

(c) $\frac{15}{4}$ (d) $\frac{75}{16}$

156. ΔABC and ΔDEF are similar. If AB = 92 cm, BC = 48 cm, AC = 120 cm, and the length of the smallest side of ΔDEF is 200 cm, then find the length of the longest side of ΔDEF?

SSC CGL 09/12/2022 (Shift-02)

(a) 400 cm (b) 225 cm

(c) 350 cm (d) 500 cm

157. If $\Delta ABC \sim \Delta QRP$, $\frac{ar(\Delta ABC)}{ar(\Delta QRP)} = \frac{9}{4}$, AB = 18 cm, BC = 15 cm, then the length of PR is:

SSC CGL 05/12/2022 (Shift-04)

(a) 16 cm (b) 14 cm

(c) 10 cm (d) 12 cm

158. If areas of similar triangles ΔABC and ΔDEF are x^2 cm^2 and y^2 cm^2 respectively, and EF = a cm, then BC (in cm) is:

SSC CGL 01/12/2022 (Shift-02)

(a) $\frac{y^2}{a^2x^2}$ (b) $\frac{y}{ax}$

(c) $\frac{ax}{y}$ (d) $\frac{a^2x^2}{y^2}$

159. Two similar triangles are ΔXYZ and ΔLMN. If area of (ΔXYZ) = 16 cm^2, area of (ΔLMN) = 25 cm^2 and YZ = 2.4 cm, then the measure of MN is:

SSC CPO 27/06/2024 (Shift-03)

(a) 1 cm (b) 3 cm

(c) 2 cm (d) 4 cm

160. ΔABC and ΔDEF are similar triangles, and their areas are 81 cm^2 and 144 cm^2, respectively. If EF = 20 cm, then what is the value of BC?

SSC CHSL 11/07/2024 (Shift-03)

(a) 9 cm (b) 12 cm

(c) 13 cm (d) 15 cm

161. ΔABC and ΔPQR are similar. The areas of these two triangles are 289 sq.cm and 576 sq.cm, respectively. If PR = 12 cm, then AC = ?

SSC CHSL 10/07/2024 (Shift-04)

(a) 7.25 cm (b) 6 cm

(c) 8.5 cm (d) 12 cm

162. $\Delta ABC \sim \Delta EDF$ and area (ΔABC) : area (ΔEDF) = 9 : 4. If AB = 5 cm, BC = 8 cm and CA = 10 cm, then DF is equal to:

SSC CHSL 03/07/2024 (Shift-04)

(a) $3\frac{1}{4}$ cm (b) $4\frac{2}{3}$ cm

(c) $3\frac{2}{3}$ cm (d) $5\frac{1}{3}$ cm

163. ΔABC and ΔDEF are similar and their areas are respectively 0.64 m^2 and 0.0121 m^2. If EF = 0.154 m, then BC is:

SSC CHSL 05/07/2024 (Shift-02)

(a) 1.15 m (b) 11. 2 m

(c) 1.12 m (d) 2.12 m

164. ΔXYZ is similar to ΔPRQ. If the ratio of the perimeter of ΔXYZ to the perimeter of ΔPQR is 16 : 9 and PQ = 3.6 cm, then what is the length (in cm) of XY?

SSC CHSL 09/07/2024 (Shift-02)

(a) $2\frac{3}{5}$ (b) $4\frac{3}{5}$

(c) $6\frac{2}{5}$ (d) $3\frac{4}{5}$

165. $\Delta ABC \sim \Delta EDF$ and area (ΔABC): area (ΔEDF) = 1 : 4. If AB = 7 cm, BC = 8 cm and CA = 9 cm, then DF is equal to:

SSC CHSL 11/07/2024 (Shift-03)

(a) 16 cm (b) 18 cm

(c) 14 cm (d) 12 cm

166. The areas of two similar triangles ΔPQR and ΔXYZ are 12.96 cm^2 and 635.04 cm^2, respectively. If QR = 2.9 cm, then the length (in cm) of YZ equals:

SSC CHSL 02/07/2024 (Shift-01)

(a) 30.4 (b) 20.3

(c) 23.2 (d) 25.2

167. ΔABC is similar to ΔDEF and the ratio of the area of ΔABC to ΔDEF is 25 : 144. If AB = p cm, AC = q cm and BC = r cm, then DE = ?

SSC CHSL 05/07/2024 (Shift-01)

(a) $\frac{5}{12}q$ (b) $\frac{12}{5}q$

(c) $\frac{5}{12}p$ (d) $\frac{12}{5}p$

168. If the perimeter of two similar triangles are in the ratio of 4 : 7, and the sum of the areas is 195 cm^2, then what is $\frac{1}{3}$ of the difference between the areas (in cm^2) of the two triangles?

SSC CHSL 03/07/2024 (Shift-05)

(a) 33 (b) 54

(c) 99 (d) 63

169. The perimeters of two similar triangles ΔRST and ΔABC are 26 cm and 39 cm, respectively. If AB = 24 cm, then RS is ____.

SSC CGL 13/09/2024 (Shift-03)

(a) 16 cm (b) 36 cm

(c) 18 cm (d) 24 cm

170. If $\Delta ABC \sim \Delta PQR$, the ratio of perimeter of ΔABC to perimeter of ΔPQR is 36:23 and QR = 3.8 cm, then the length of BC is:

SSC CHSL 09/08/2023 (Shift-01)

(a) $4\frac{103}{121}$ cm (b) $3\frac{109}{121}$ cm

(c) $5\frac{109}{115}$ cm (d) $3\frac{107}{115}$ cm

171. ΔABC is similar to ΔPQR. If the ratio of the perimeter of ΔABC and perimeter of ΔPQR is 24 : 16 and PQ = 4.8 cm, then the length (in cm) of AB is:

SSC CHSL 08/08/2023 (Shift-02)

(a) 8.6 (b) 7.2

(c) 4.6 (d) 2.8

172. If ΔABC and ΔPQR are similar. AB = 8 cm, PQ = 12 cm, QR = 18 cm and RP = 24 cm, then the perimeter of ΔABC is _____ cm.

SSC CHSL 02/07/2024 (Shift-02)

(a) 27 (b) 42

(c) 54 (d) 36

173. In a ΔPQR, RS intersects PQ at point S. The sides of the triangle QR = 36 cm, SQ = 27 cm, RS = 18 cm and ∠QRS = ∠QPR. What is the ratio of the perimeter of ΔPRS to that of ΔQSR?

SSC CHSL 10/07/2024 (Shift-03)

(a) $\frac{8}{6}$ (b) $\frac{9}{12}$

(c) $\frac{7}{9}$ (d) $\frac{5}{8}$

174. ΔDEF and ΔGHI are two similar triangles. If DE = 64 cm, GH = 24 cm and the perimeter of ΔGHI is 72 cm, then what is the sum of the lengths (in cm) of the sides EF and FD of the ΔDEF?

SSC CHSL 04/07/2024 (Shift-03)

(a) 192 (b) 96

(c) 128 (d) 82

175. The average of the areas of 2 similar triangles is 706.5 m² whose perimeters are in the ratio of 6 : 11. What is 20% of the difference (in m²) in areas of both triangles?

SSC CHSL 08/07/2024 (Shift-01)

(a) 157 (b) 149

(c) 153 (d) 164

176. A school has two rectangular playgrounds, which are similar in shape. If the length and the breadth of the first playground are given as 224 m and 160 m, respectively, then which of the following options cannot be the dimensions of the second playground?

SSC CPO 29/06/2024 (Shift-01)

(a) Length = 273 m; Breadth = 195 m

(b) Length = 168 m; Breadth = 120 m

(c) Length = 210 m; Breadth = 150 m

(d) Length = 343 m; Breadth = 255 m

177. If M is the mid-point of the side BC of ΔABC, and the area of ΔABM is 19 cm², then the area of ΔABC is:

SSC Phase-XI 28/06/2023 (Shift-03)

(a) 36 cm² (b) 42 cm²

(c) 40 cm² (d) 38 cm²

178. The mid points of AB and AC of a ΔABC are X and Y, respectively. If BC + XY = 24 units, then the value of BC – XY is:

SSC CGL 06/12/2022 (Shift-01)

(a) 5 cm (b) 4 cm

(c) 6 cm (d) 8 cm

179. In ΔTAP, ∠TAP = 60°, TA = 6 cm AP = 8 cm. K is the midpoint of AP. A line from K is produced to meet TP at O such that ∠AKO = 120°. Find the length of OK.

SSC Phase-X 01/08/2022 (Shift-03)

(a) 5 cm (b) 4 cm

(c) 3 cm (d) 6 cm

180. In a ΔXYZ, L and M are mid points of XY and XZ. R is a point on side LM such that LR : RM = 1 : 2. If LR = 3 cm then the value of YZ is equal to:

SSC CHSL 12/10/2020 (Shift-01)

(a) 18 cm (b) 19 cm

(c) 16 cm (d) 17 cm

181. In ΔABC, P and Q are the mid points of the sides AB and AC, respectively. R is a point on the segment PQ such that PR : RQ = 1 : 5. If PR = 6 cm, then BC = ____.

SSC CHSL 04/07/2024 (Shift-02)

(a) 66 cm (b) 70 cm

(c) 68 cm (d) 72 cm

182. In ΔABC, P and Q are the middle points of the sides AB and AC, respectively. R is a point on the segment PQ such that PR : RQ = 1 : 4. If PR = 5 cm, then BC = ?

SSC Phase-XI 27/06/2023 (Shift-03)

(a) 46 cm (b) 50 cm

(c) 48 cm (d) 44 cm

183. L and M are the mid points of sides AB and AC of a ΔABC, respectively, and BC = 18 cm. If LM || BC, then find the length of LM (in cm).

SSC CHSL 02/07/2024 (Shift-04)

(a) 12 (b) 3

(c) 6 (d) 9

184. In ΔXYZ, L and M are the middle points of the sides XY and XZ, respectively. N is a point on the segment LM such that LN : NM = 1 : 2. If LN = 5 cm, then YZ is equal to:

SSC CHSL 14/08/2023 (Shift-04)

(a) 30 cm (b) 24 cm

(c) 28 cm (d) 26 cm

185. The mid points of AB and AC of a ΔABC are X and Y, respectively. If BC + XY = 18 units, then the value of BC – XY is:

SSC CGL 19/07/2023 (Shift-04)

(a) 12 cm (b) 6 cm

(c) 8 cm (d) 4 cm

186. In ΔABC, DE || BC, where D is a point on AB and E is a point on AC. If DE divides the area of ΔABC into two equal parts, then DB:AB is equal to:

SSC CGL 20/07/2023 (Shift-04)

(a) $\sqrt{2}:\sqrt{3}$ (b) $\sqrt{2}:\sqrt{2}+1$

(c) $\sqrt{2}+1:\sqrt{2}$ (d) $\sqrt{2}-1:\sqrt{2}$

187. In a right-angled ΔPQR, ∠Q = 90°. A and B are the mid-points of PQ and PR, respectively. If PQ = 16 cm, QR = 30 cm and PR = 34 cm, what is perimeter (in cm) of the trapezium ABRQ?

SSC CGL 20/04/2022 (Shift-03)

(a) 65 (b) 80

(c) 70 (d) 40

188. If in ΔABC and ΔDEF, $\frac{AB}{DE}=\frac{BC}{FD}$ then they will be similar when:

SSC CGL 19/07/2023 (Shift-03)

(a) ∠B = ∠D (b) ∠A = ∠D

(c) ∠A = ∠F (d) ∠B = E

189. If in ΔPQR and ΔDEF, ∠P = 52°, ∠Q = 74°, ∠R = 54°, ∠D = 54°, ∠E = 74° and ∠F = 52°, then which of the following is correct?

SSC CHSL 03/08/2023 (Shift-03)

(a) ΔPQR ~ ΔFED

(b) ΔRQP ~ ΔFED

(c) ΔPRQ ~ ΔFED

(d) ΔPQR ~ ΔDEF

190. If ΔABC ~ ΔFDE such that AB = 9 cm, AC = 11 cm, DF = 16 cm and DE = 12 cm, then the length of BC is:

SSC CGL 03/12/2022 (Shift-02)

(a) $5\frac{3}{4}$ cm (b) $4\frac{3}{5}$ cm

(c) $3\frac{5}{7}$ cm (d) $6\frac{3}{4}$ cm

191. ΔABC and ΔPQR are similar to each other. If $m(\overline{BC})$ = 5cm, $m(\overline{QR})$ = 12.5cm, and $m(\overline{PQ})$ = 6.25cm, find $m(\overline{AB})$.

SSC CHSL 26/05/2022 (Shift-[illegible])

(a) 6 cm (b) 2.5 cm

(c) 6.25 cm (d) 10 cm

192. ΔEFG and ΔHIJ are similar. Also, ∠E = ∠H and ∠F = ∠I. If 3EF = HI and FG = 9 cm, then IJ is equal to ____

SSC CGL 10/09/2024 (Shift-02)

(a) 9 cm (b) 27 cm

(c) 3 cm (d) 18 cm

193. ABC is a triangle and D is a point on the side BC. If BC = 16 cm, BD = 11 cm and ∠ADC = ∠BAC, then the length of AC is equal to:

SSC CGL 27/07/2023 (Shift-02)

(a) $4\sqrt{5}$ cm (b) 4 cm

(c) $3\sqrt{5}$ cm (d) 5 cm

194. In ΔABC, D is a point on side BC such that ∠ADC = ∠BAC. If CA = 15cm and CD = 9cm, then CB (in cm) = ?

SSC CGL 13/04/2022 (Shift-02)

(a) 12 (b) 25

(c) 15 (d) 10

195. In ΔABC, $\angle A = 85°$ and $\angle C = 58°$ If ΔPQR is similar to ΔABC, and in correspondence, then find $\angle Q$.

SSC CHSL TIER-II 02/11/2023

(a) 58°
(b) 37°
(c) 85°
(d) 73°

196. In ΔPQR, S and T are points on the sides PQ and PR, respectively, such that ΔPST is similar to ΔPRQ. If $m\angle PQR = 47°$, then find $m\angle STR$.

SSC Phase-XI 28/06/2023 (Shift-03)

(a) 130°
(b) 133°
(c) 120°
(d) 123°

197. ΔABC, AB = 20 cm, BC = 7 cm and AC = 15 cm. Side BC is produced to D such that $\Delta DAB \sim \Delta DCA$. The length of CD is:

SSC PHASE-IX 2022

(a) 9 cm
(b) 8 cm
(c) 10 cm
(d) 12 cm

198. In ΔABC, DE||AB, where D and E are points on sides AC and BC, respectively. F is a point between C and D such that EF || BD. If AD = 15cm, DC = 10cm, then the length of CF is:

SSC CHSL 13/04/2021 (Shift-01)

(a) 3 cm
(b) 7.5 cm
(c) 4 cm
(d) 5 cm

199. O is a point in the interior of ΔABC such that OA = 12 cm, OC = 9 cm, $\angle AOB = \angle BOC = \angle COA$ and $\angle ABC = 60°$. What is the length (in cm) of OB?

SSC CGL Tier II 29/01/2022

(a) $6\sqrt{3}$
(b) $4\sqrt{6}$
(c) $4\sqrt{3}$
(d) $6\sqrt{2}$

200. In ΔABC, P is a point on AB such that PB : AP = 3 : 4 and PQ is parallel to AC. If AR and QS are perpendicular to PC and QS = 9 cm, what is the length (in cm) of AR?

SSC CPO 27/06/2024 (Shift-01)

(a) 28
(b) 35
(c) 21
(d) 14

201. Two triangles ABC and DEF are similar. The smallest side of ABC is equal to 15 units. If the sides of ABC are in the ratio 3 : 4 : 5, and the area of DEF is half of the area of ABC, then what is the largest side of DEF (in units)?

SSC CHSL 08/07/2024 (Shift-04)

(a) $25\sqrt{2}$
(b) $25\sqrt{3}$
(c) $\frac{25}{\sqrt{3}}$
(d) $\frac{25}{\sqrt{2}}$

202. ΔABC is similar to ΔPQR. AB = 4 cm, BC = 8 cm and AC = 10 cm. If QR = 16 cm, then what is the area of ΔPQR?

SSC CHSL 21/03/2023 (Shift-02)

(a) $2\sqrt{231}$ cm²
(b) $4\sqrt{231}$ cm²
(c) $4\sqrt{462}$ cm²
(d) $8\sqrt{462}$ cm²

◆ TYPE – III ◆
TYPE OF TRIANGLES

203. In the following sets, which set represents the sides of a right-angled triangle?

SSC CGL 23/09/2024 (Shift-01)

(a) {3, 4, 6}
(b) {8, 15, 16}
(c) {5, 10, 12}
(d) {5, 12, 13}

204. Which of the following are the sides of a right-angled triangle?

SSC CHSL 01/07/2024 (Shift-04)

(a) 6 cm, 7 cm, 10 cm
(b) 5 cm, 11 cm, 13 cm
(c) 16 cm, 31 cm, 34 cm
(d) 12 cm, 16 cm, 20 cm

205. In a ΔABC, $\angle BAC = 30°$ and $\angle BCA = 60°$. If AC = 13 cm and AB = 12 cm, then BC equal to:

SSC CPO 27/06/2024 (Shift-03)

(a) 6 cm
(b) 5 cm
(c) 4 cm
(d) 7 cm

206. If $x^2 - 1$, $2x$ and $x^2 + 1$ are the three sides of a right angled triangle, then which of the following can be its hypotenuse?

SSC Phase-XII 20/06/2024 (Shift-03)

(a) $x^2 + 1$
(b) $2x$
(c) $x^2 - 1$
(d) x^2

207. If the hypotenuse of a right-angled triangle is 29 cm and the sum of the other two sides is 41 cm, then the difference between the other two sides is:

SSC CPO 03/10/2023 (Shift-01)

(a) 2 cm
(b) 5 cm
(c) 10 cm
(d) 1 cm

208. Let ABC be a triangle whose $\angle B$ is right angled. If $\angle C = 60°$ and AB = 3cm, then find the lengths of BC and AC respectively.

SSC CHSL 04/08/2023 (Shift-03)

(a) 9 cm, $4\sqrt{3}$ cm
(b) $\sqrt{3}$ cm, $4\sqrt{3}$ cm
(c) $\sqrt{3}$ cm, $2\sqrt{3}$ cm
(d) 2 cm, $2\sqrt{3}$ cm

209. In a ΔPQR, S is a point on the side QR such that PS⊥QR, then which of the following options is true?

SSC CGL 12/09/2024 (Shift-01)

(a) $PS^2 + PR^2 = PQ^2 + QR^2$
(b) $PR^2 + QS^2 = PQ^2 + SR^2$
(c) $PQ^2 + PR^2 = QS^2 + SR^2$
(d) $PS^2 + QS^2 = PQ^2 + PR^2$

210. The lengths of the three sides of a triangle are given as 3 cm, 4 cm and 5 cm. The ratio of their corresponding altitudes to the opposite vertices will be:

SSC Phase-XII 26/06/2024 (Shift-03)

(a) 3 : 4 : 5
(b) 5 : 4 : 3
(c) 9 : 8 : 7
(d) 20 : 15 : 12

211. The area of a triangle is 486 cm² and its sides are in the ratio 3:4:5. The perimeter of the triangle is:

SSC CPO 29/06/2024 (Shift-02)

(a) 105 cm
(b) 218 cm
(c) 108 cm
(d) 308 cm

212. The difference between the two perpendicular sides of a right-angled triangle is 2 cm and its area is 24 cm². What is the perimeter (in cm) of the triangle?

SSC CPO 29/06/2024 (Shift-01)

(a) 24
(b) 14
(c) 16
(d) 18

213. Find the perimeter of a triangle with sides equal to 13 cm, 12 cm and 5 cm.

SSC CPO 28/06/2024 (Shift-03)

(a) 15 cm
(b) 5 cm
(c) 25 cm
(d) 30 cm

214. The triangle has sides 3 cm, 4 cm and 5 cm. What is the length of the perpendicular from the opposite vertex to the side whose length is 5 cm ?

SSC CHSL 02/07/2024 (Shift-05)

(a) 2.4 cm
(b) 3.5 cm
(c) 1.4 cm
(d) 2.2 cm

215. The sides of a triangle are 20 cm and 29 cm. The area of the triangle formed by joining the mid points of the sides of triangle will be :

SSC CHSL 10/08/2023 (Shift-03)

(a) $67\frac{2}{3}\text{cm}^2$
(b) $52\frac{1}{2}\text{cm}^2$
(c) $47\frac{1}{2}\text{cm}^2$
(d) $58\frac{1}{3}\text{cm}^2$

216. In a right angle triangle with sides 12 cm and 16 cm and hypotenuse 20 cm, the length of altitude drawn on the hypotenuse from the opposite vertex is K. Find the value of K.

SSC CHSL 09/07/2024 (Shift-03)

(a) 6.9 cm
(b) 9.6 cm
(c) 6.8 cm
(d) 8.6 cm

217. ΔPQR is a right-angled triangle. $\angle PQR = 90°$ and QS ⊥ PR. If PQ = 6 cm and PS = 4 cm, then find the length of QS.

SSC CHSL 10/03/2023 (Shift-04)

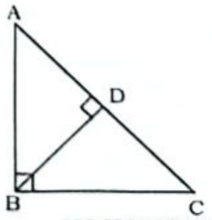
(a) $2\sqrt{5}$ cm
(b) 3 cm
(c) 6 cm
(d) 5 cm

218. In ΔXYZ, $\angle Y = 90°$ and YN is perpendicular to XZ. If XY = 30 cm and XZ = 34 cm. then what is the value of YN ?

SSC CHSL 09/03/2023 (Shift-04)

(a) $\frac{280}{17}$ cm
(b) $\frac{210}{17}$ cm
(c) $\frac{220}{17}$ cm
(d) $\frac{240}{17}$ cm

219. In the given figure, AB = 8 cm, AC = 17 cm. What is the length of AD?



SSC CPO 09/11/2022 (Shift-02)

(a) 4.68 cm
(b) 5.36 cm
(c) 3.76 cm
(d) 8.5 cm

220. ABC is a right angle triangle and ∠ABC = 90°. BD is a perpendicular on the side AC. What is the value of BD^2?

SSC CGL TIER-II 08/08/2022

(a) AD × AC (b) BC × AB
(c) BC × CD (d) AD × DC

221. In a right-angled triangle ABC such that ∠BAC = 90° and AD is perpendicular to BC. If the area of ΔABC is 63cm², area of ΔACD = 7cm², and AC = 5 cm, then the length of BC is equal to:

SSC CHSL 03/07/2024 (Shift-02)

(a) 10 cm (b) 15 cm
(c) 18 cm (d) 12 cm

222. In ΔABC, ∠A = 90°, AD ⊥ BC at D. If AB = 12 cm and AC = 16 cm, then what is the length (in cm) of BD?

SSC CGL 16/08/2021 (Shift-01)

(a) 8.4 (b) 7.8
(c) 7.2 (d) 6.2

223. Let ABC be a right-angled triangle such that ∠C = 90°. Let D be a point on AB such that CD is perpendicular to AB. If AC = 5 cm and BC = 12 cm, find the length of CD (in cm).

SSC CHSL 05/07/2024 (Shift-04)

(a) $\frac{60}{13}$ (b) $\frac{40}{13}$
(c) $\frac{40}{23}$ (d) $\frac{50}{23}$

224. ΔABC is a right-angled triangle where m∠ABC = 90°. If $m(\overline{AB})$ = 15 cm, $m(\overline{BC})$ = 20 cm, and $\overline{BD} \perp \overline{AC}$, intersecting $\overline{AC}$ at the point D, find $m\overline{BD}$ (in cm).

SSC CHSL 04/07/2024 (Shift-01)

(a) 12.5 (b) 12
(c) 10 (d) 9

225. ΔABC is right angle at B. BD is an altitude intersecting AC at D. If AC = 9 cm and CD = 3 cm, then find the measure of AB (in cm).

SSC CGL 24/08/2021 (Shift-03)

(a) 3 (b) $6\sqrt{3}$
(c) 6 (d) $3\sqrt{6}$

226. In right-angled triangle ABC, ∠C = 90, CM is perpendicular on AB. If AB = 18 cm and BM = 6 cm, then find the length of CM.

SSC CGL 17/09/2024 (Shift-02)

(a) $6\sqrt{2}$ cm (b) $4\sqrt{2}$ cm
(c) $7\sqrt{2}$ cm (d) $2\sqrt{2}$ cm

227. In ΔABC, ∠C= 90° and Q is the midpoint of BC. If AB = 10 cm and AC = $2\sqrt{10}$ cm, then the length of AQ is:

SSC CGL 13/08/2021 (Shift-03)

(a) $\sqrt{55}$ (b) $5\sqrt{3}$
(c) $5\sqrt{2}$ (d) $3\sqrt{5}$

228. Points P and Q are on the sides AB and BC respectively of a ΔABC, right angled at B. If AQ = 11 cm, PC = 8 cm, and AC = 13 cm, then find the length (in cm) of PQ.

SSC CGL 20/08/2021 (Shift-02)

(a) $4\sqrt{7}$ (b) $\sqrt{15}$
(c) 4.5 (d) 4

229. In ΔPQR, ∠P = 90°. S and T are the mid points of sides PR and PQ, respectively. What is the value of $RQ^2/(QS^2 + RT^2)$?

SSC CGL Tier II 16/11/2020

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) $\frac{4}{5}$

230. In ΔABC, ∠C = 90°. Points P and Q are on the sides AC and BC, respectively, such that AP:PC = BQ:QC = 1:2. Then, $\frac{AQ^2 + BP^2}{AB^2}$ is equal to:

SSC CGL TIER-II 15/11/2020

(a) $\frac{4}{9}$ (b) $\frac{4}{3}$
(c) $\frac{13}{9}$ (d) $\frac{8}{3}$

231. Two medians QT and RS of the ΔPQR intersect at G at right angles. If QT = 18 cm and RS = 27 cm. then the length of QS is:

SSC CHSL 21/03/2023 (Shift-01)

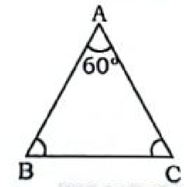
(a) 20 cm (b) 15 cm
(c) 13 cm (d) 10 cm

232. BD and CE are the medians of ΔABC, right angled at A. If CE = $\frac{5\sqrt{13}}{2}$ cm, BC = 10cm, then the length of BD is:

SSC CHSL 04/08/2021 (Shift-03)

(a) $3\sqrt{5}$ cm (b) $3\sqrt{7}$ cm
(c) $\sqrt{13}$ cm (d) $\frac{5}{2}\sqrt{7}$ cm

233. In the ΔABC, AB = 12 cm and AC = 10 cm, and ∠BAC = 60° What is the value of the length of the side BC?



SSC CGL 01/12/2022 (Shift-01)

(a) 10 cm (b) 7.13 cm
(c) 13.20 cm (d) 11.13 cm

234. In ΔLMN, LM = $5\sqrt{2}$ cm, LN = 13 cm and ∠LMN = 135°. What is the length (in cm) of MN?

SSC CGL Tier II 29/01/2022

(a) 7 (b) 8
(c) $8\sqrt{2}$ (d) $7\sqrt{2}$

235. In ΔABC, if the three sides are a = 5, b = 7 and c = 3, what is ∠B?

SSC CHSL 24/05/2022 (Shift-01)

(a) 120° (b) 60°
(c) 90° (d) 150°

236. In ΔABC, ∠B = 135°, AB = $5\sqrt{2}$ cm and BC = 7cm, The length of AC is.

SSC PHASE-IX 2022

(a) $3\sqrt{11}$cm (b) $12\sqrt{2}$cm
(c) 12 cm (d) 13 cm

237. The angles of a triangle are in the ratio 1 : 2 : 3, then find the ratio of the corresponding sides.

SSC CPO 28/06/2024 (Shift-01)

(a) 1 : 2 : $\sqrt{3}$ (b) 1 : 2 : 3
(c) 1 : $\sqrt{2}$: 3 (d) 1 : $\sqrt{3}$: 2

238. If one angle of ΔPQR is greater than the sum of the other two, the ΔPQR will be:

SSC CPO 29/06/2024 (Shift-01)

(a) Obtuse angle (b) Equilateral
(c) Right angle (d) Acute angle

239. x, y and z are the sides of a triangle. If z is the largest side and $x^2 + y^2 > z^2$, then the triangle is a:

SSC CGL TIER-II 08/08/2022

(a) Isosceles right angled triangle
(b) Right angled triangle
(c) Acute angled triangle
(d) Obtuse angled triangle

240. One angle of an isosceles obtuse triangle is $28\frac{1}{2}$°. Find the measure of its obtuse angle in degrees.

SSC CHSL 07/08/2023 (Shift-01)

(a) 132° (b) 112°
(c) 121° (d) 123°

241. Which of the following are the angles of a scalene triangle?

SSC CGL 23/09/2024 (Shift-01)

(a) 60°, 30° and 90°
(b) 60°, 60° and 60°
(c) 110°, 35° and 35°
(d) 90°, 45° and 45°

242. A scalene ΔABC has two sides whose measures are 3.8 cm and 6 cm, respectively. Which of the following CANNOT be the measure (in cm) of its third side?

SSC CPO 29/06/2024 (Shift-03)

(a) 3.0 (b) 2.7
(c) 2.4 (d) 2.2

243. If the length of each of the two equal sides of an isosceles triangle is 15 cm and the adjacent angle is 30°, then the area of the triangle is:

SSC Phase-XII 20/06/2024 (Shift-01)

(a) 26.25 cm² (b) 36.25 cm²
(c) 56.25 cm² (d) 66.25 cm²

244. Find the altitude (in cm) from the vertex Q to side PR of ΔPQR with side lengths PQ = 40 cm, PR = 40 cm and QR = 60 cm.

SSC CHSL 11/07/2024 (Shift-01)

(a) $25\sqrt{7}$ (b) $15\sqrt{7}$
(c) $30\sqrt{7}$ (d) $20\sqrt{7}$

245. Find the altitude (in cm) of side MT of ΔMNT with side MN = 36 cm, MT = 36 cm and NT = 48 cm.

SSC CHSL 08/07/2024 (Shift-03)

(a) $16\sqrt{5}$ (b) $18\sqrt{3}$
(c) $12\sqrt{5}$ (d) $24\sqrt{3}$

246. The perimeter of an isosceles triangle is 50 cm. If the base is 18 cm, then find the length of the equal sides.

SSC CGL 07/03/2020 (Shift-02)

(a) 18 cm (b) 25 cm
(c) 16 cm (d) 32 cm

247. If the lengths of two sides of an isosceles triangle are 6 cm and 12 cm, then find the length of the third side.

SSC CGL 25/09/2024 (Shift-01)

(a) 8 cm (b) 6 cm
(c) 12 cm (d) 14 cm

248. In ΔXYZ, $XY = YZ$ and $m\angle X = 78°$. Find the value of $m\angle Y$.

SSC CHSL 05/07/2024 (Shift-01)

(a) 28° (b) 24°
(c) 34° (d) 39°

249. ΔXYZ is an isosceles triangle with sides $XY = XZ$. If the measure of $\angle Y$ is 80°, what is the measure of $\angle X$?

SSC CGL 24/09/2024 (Shift-01)

(a) 30° (b) 40°
(c) 20° (d) 50°

250. In an isosceles triangle, the vertex angle is four times the sum of the base angles. The measure of the square root of the vertex angle is:

SSC CHSL 10/07/2024 (Shift-04)

(a) 16° (b) 18°
(c) 10° (d) 12°

251. If the vertical angle of an isosceles triangle is 42°, then the measure of the other two angles will be:

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 59° and 59° (b) 69° and 69°
(c) 79° and 79° (d) 89°and 89°

252. In an isosceles ΔLMN, $LM = LN$, and $\angle MLN = 37°$ Find $\angle MNL$.

SSC Phase-XII 26/06/2024 (Shift-02)

(a) 60.5° (b) 70.0°
(c) 65.0° (d) 71.5°

253. In an isosceles triangle, if the unequal angle is five times the sum of the equal angles, then each equal angle is:

SSC CHSL 08/08/2023 (Shift-01)

(a) 45° (b) 60°
(c) 15° (d) 30°

254. In an isosceles triangle ABC, $AB = AC$. D is a point inside the triangle such that $\angle BAD = 20° = \angle DCB$, $\angle CAD = 80°$ The value of $\angle ABC$ is:

SSC CHSL 10/07/2024 (Shift-02)

(a) 25° (b) 15°
(c) 20° (d) 40°

255. ΔPQR and ΔSQR are both isosceles triangles on a common base QR such that P and S lie on the same side of QR. If $\angle QSR = 60°$ and QPR $= \angle 100°$, then find $\angle SRP$.

SSC CHSL 03/08/2023 (Shift-01)

(a) 80° (b) 60°
(c) 100° (d) 20°

256. In ΔABC, $AB = AC$, O is a point on BC such that $BO = CO$ and OD is perpendicular to AB and OE is perpendicular to AC. If $\angle BOD = 60°$, then measure of $\angle AOE$ is:

SSC CGL 02/12/2022 (Shift- 02)

(a) 120° (b) 60°
(c) 30° (d) 90°

257. In a ΔPQR, $PQ = PR$ and PT is perpendicular to QR. If $PQ = 17$ cm, $PT = 15$ cm, then what is the measure (in cm) of QR?

SSC CGL 18/09/2024 (Shift-02)

(a) 8 (b) 24
(c) 16 (d) 32

258. In a ΔABC, P is the midpoint of BC. If $AB = (2x + 4)$ cm, $AC = 6$ cm and $AP \perp BC$, then the value of x is:

SSC Phase-XII 24/06/2024 (Shift-02)

(a) 1 (b) 4
(c) 3 (d) 2

259. ΔPQR is an isosceles triangle and $PQ = PR = 2a$ unit, $QR = a$ unit. Draw $PX \perp QR$, and find the length of PX.

SSC CGL 06/12/2022 (Shift-04)

(a) $\sqrt{5}a$ (b) $\frac{\sqrt{5}a}{2}$
(c) $\frac{\sqrt{10}a}{2}$ (d) $\frac{\sqrt{15}a}{2}$

260. In the isosceles ΔABC with BC being the unequal side of the triangle, and line AD is the median drawn from the vertex A to the side BC. If the length of $AC = 5$ cm and the length of the median is 4 cm, then find the length of BC in cm).

SSC CHSL 15/03/2023 (Shift-03)

(a) 4 (b) 6
(c) 5 (d) 3

261. If the altitude from two vertices of a triangle to the opposite sides are equal, then the triangle will be:

SSC CGL 26/09/2024 (Shift-03)

(a) isosceles triangle
(b) equilateral triangle
(c) scalene triangle
(d) obtuse angle triangle

262. In ΔABC, D is the mid-point of BC. If DL perpendicular to AB and DM perpendicular to AC such that $DL = DM$, then the triangle will be:

SSC CGL 17/09/2024 (Shift-03)

(a) isosceles triangle
(b) right angled triangle
(c) obtuse angle triangle
(d) equilateral triangle

263. If the medians of a triangle are equal, then the triangle will be?

SSC CGL 23/09/2024 (Shift-02)

(a) equilateral triangle
(b) obtuse angle triangle
(c) scalene triangle
(d) right angled triangle

264. If the sum of two sides of an equilateral triangle is 16 cm, then find the third side.

SSC CGL 09/09/2024 (Shift-01)

(a) 4 cm
(b) 16 cm
(c) Cannot be found
(d) 8 cm

265. Find the area of an equilateral triangle whose sides are 16 cm each.

SSC Phase-XII 20/06/2024 (Shift-02)

(a) $66\sqrt{3}$ cm² (b) $64\sqrt{3}$ cm²
(c) $62\sqrt{3}$ cm² (d) $60\sqrt{3}$ cm²

266. The area of an equilateral triangle is $289\sqrt{3}$ cm². Find the length (in cm) of its sides.

SSC Phase-XII 25/06/2024 (Shift-02)

(a) 34 (b) 17
(c) 36 (d) 27

267. ΔPQR has three sides equal in measurement and if PM is perpendicular to QR, then which of the following equality holds?

SSC CHSL 04/08/2023 (Shift-02)

(a) $3PM^2 = 2PM^2$ (b) $3PQ^2 = 4PM^2$
(c) $3PM^2 = 4PQ^2$ (d) $3PQ^2 = 2PM^2$

268. In an equilateral ΔPQR, S is point on the side QR such that $QR = 3QS$. If $PQ = 9$ cm, then what will be the length (in cm) of PS?

SSC CPO 05/10/2023 (Shift-02)

(a) $\sqrt{63}$ (b) $\sqrt{62}$
(c) $\sqrt{60}$ (d) $\sqrt{61}$

269. ΔABC is an equilateral triangle. D is a point on side BC such that $BD : BC = 1 : 3$. If $AD = 5\sqrt{7}$ cm, then the side of the triangle is:

SSC CGL 18/08/2021 (Shift-02)

(a) 18 cm (b) 12 cm
(c) 20 cm (d) 15 cm

270. The measure of each side of an equilateral triangle is 16 cm. What is the ratio of its perimeter to the sum of its medians?

SSC CHSL 11/07/2024 (Shift-02)

(a) $\sqrt{3} : 2$ (b) $1 : 2\sqrt{3}$
(c) $2\sqrt{3} : 1$ (d) $2 : \sqrt{3}$

271. ABC is an equilateral triangle. P, Q and R are the midpoints of sides AB, BC and CA respectively. If the length of the side of the ΔABC is 8 cm, then the area of ΔPQR is :

SSC CGL 06/03/2019 (Shift-01)

(a) $8\sqrt{3}$ cm² (b) $4\sqrt{3}$ cm²
(c) $\frac{\sqrt{3}}{3}$ cm² (d) $\frac{\sqrt{3}}{4}$ cm²

272. X, Y and Z are three equilateral triangles. The sum of the areas of X and Y is equal to the area of Z. If the side lengths of X and Y are 6 cm and 8 cm respectively, then what is the side length of Z?

SSC CHSL 13/03/2023 (Shift-02)

(a) 10 cm (b) 10.5 cm
(c) 9.5 cm (d) 9 cm

273. ΔABC is an equilateral triangle. The side BC is produced to point D. If A joins D and BC = CD, then the degree measure of ∠CAD is equal to:

SSC CHSL 09/08/2023 (Shift-03)

(a) 30°
(b) 15°
(c) 45°
(d) 18°

• TYPE – IV •
CENTERS OF TRIANGLE

274. In ΔDEF, DP is the bisector of ∠D, meeting EF at P. If DE = 14 cm, DF = 21 and EF = 9 cm, find EP.

SSC CHSL 03/08/2023 (Shift-02)

(a) 3.6 cm
(b) 5.4 cm
(c) 6.3 cm
(d) 2.7 cm

275. In ΔDEF, the bisector of ∠D intersects side EF at point N. If DE = 36 cm, DF = 40 cm and EF = 38 cm, then the length (in cm) of NF is ______.

SSC CGL 12/09/2024 (Shift-02)

(a) 16
(b) 20
(c) 18
(d) 12

276. In ΔABC, AB = 6 cm, BC = 9 cm and AC = 12 cm. If AD is the angle bisector of ∠BAC, where D is a point on BC, then DC (in cm) is equal to:

SSC CGL 24/09/2024 (Shift-03)

(a) 9
(b) 6
(c) 3
(d) 7

277. In ΔABC, AD is the internal bisector of ∠A, meeting the side BC at D. If BD = 5 cm, BC = 7.5 cm, then AB : AC is:

SSC CPO 27/06/2024 (Shift-01)

(a) 1 : 2
(b) 1 : 3
(c) 3 : 1
(d) 2 : 1

278. If in ΔXYZ, XY = 4 and XZ = 5 cm, and Q is a point on YZ such that XQ bisects ∠X, then YQ : QZ is:

SSC CGL 18/07/2023 (Shift-03)

(a) 2 : 3
(b) 3 : 2
(c) 5 : 4
(d) 4 : 5

279. In ΔXYZ, if XY = 5 cm, XZ = 7cm and Q is a point on YZ such that XQ bisects ∠X, then find the value of YQ : QZ.

SSC CHSL TIER-II 10/01/2024

(a) 7 : 5
(b) 5 : 12
(c) 7 : 12
(d) 5 : 7

280. In ΔPQR, the bisector of ∠R meets side PQ at S, PR = 10 cm, RQ = 14 cm and PQ = 12 cm. What is the length of SQ?

SSC CGL TIER-II 03/02/2022

(a) 5 cm
(b) 6 cm
(c) 7 cm
(d) 8 cm

281. In ΔABC with sides 8 cm, 9 cm and 12 cm, the angle bisector of the largest angle divides the opposite sides into two segments. What is the length of the shorter segment?

SSC CPO 05/10/2023 (Shift-03)

(a) $5\frac{11}{17}$ cm
(b) $6\frac{13}{17}$ cm
(c) $4\frac{11}{17}$ cm
(d) $3\frac{9}{17}$ cm

282. In ΔABC, AD is the angle bisector of ∠A. If AB = 8.4 cm and AC = 5.6 cm and DC = 2.8 cm, then the length of side BC will be:

SSC CGL 05/12/2022 (Shift-01)

(a) 4.2 cm
(b) 5.6 cm
(c) 7 cm
(d) 2.8 cm

283. In ΔABC, AD is the bisector of ∠A. If AB = 5 cm, AC = 7.5 cm and BC = 10 cm, then what is the distance of D from the mid-point of BC (in cm) ?

SSC CGL 23/08/2021 (Shift-01)

(a) 2
(b) 1.5
(c) 2.2
(d) 1

284. Points D, E and F are on the sides AB, BC and AC, respectively, of ΔABC such that AE, BF and CD bisect ∠A, ∠B and ∠C, respectively. If AB = 6 cm, BC = 7 cm and AC = 8 cm, then what will be the length of BE?

SSC CHSL 06/08/2021 (Shift-03)

(a) 3.5 cm
(b) 4 cm
(c) 3.6 cm
(d) 3 cm

285. ABC is a right-angled triangle, right angled at A in such a way that AB = AC and the bisector of angle B intersects the side AC at D. DM is perpendicular to BC, intersecting BC at M. If AB = 12 cm and BC = $12\sqrt{2}$ cm, then find the length of side AD.

SSC CHSL 08/07/2024 (Shift-02)

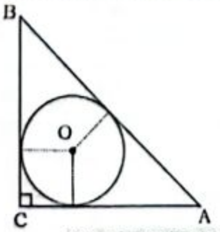
(a) $12(\sqrt{2}+2)$cm
(b) $12(\sqrt{2}-2)$cm
(c) $12(\sqrt{2}-1)$cm
(d) $12(\sqrt{2}+1)$cm

286. In a ΔABC, AB : AC = 5 : 2, BC = 9 cm. BA is produced to D, and the bisector of the ∠CAD meets BC produced at E. What is the length (in cm) of CE?

SSC CGL 13/08/2021 (Shift-02)

(a) 9
(b) 10
(c) 6
(d) 3

287. A circle of radius 4 cm is drawn inscribed in a right angle triangle ΔABC, right angled at C. If AC =12 cm, then the value of CB is:



SSC CGL 25/07/2023 (Shift-04)

(a) 8 cm
(b) 12 cm
(c) 20 cm
(d) 16 cm

288. In ΔABC, ∠A = 66° and ∠B = 50°. If the bisectors of ∠B and ∠C meet at P, then, ∠BPC – ∠PCA = ?

SSC CGL TIER-II 29/01/2022

(a) 93°
(b) 91°
(c) 81°
(d) 83°

289. In an isosceles triangle, the angle between equal sides is 40°. The bisectors of the other two angles will intersect each other at an angle of:

SSC CHSL 0/07/2024 (Shift-03)

(a) 100°
(b) 105°
(c) 120°
(d) 110°

290. In ΔOPQ, ∠O = 50°, ∠P = 70°, and the bisectors of ∠P and ∠Q meet at R. Find ∠PRQ.

SSC Phase-XII 25/06/2024 (Shift-04)

(a) 118°
(b) 125°
(c) 120°
(d) 115°

291. Let ABC be a triangle such that ∠ABC = 70° and ∠ACB = 50°. Let O be the incentre of the triangle. Find ∠BOC.

SSC CHSL 05/07/2024 (Shift-04)

(a) 120°
(b) 130°
(c) 100°
(d) 60°

292. In a ΔPQR, the bisectors of ∠Q and ∠R meet at point O, inside the triangle. If ∠QOR = 107°, then the measure of ∠P is:

SSC CGL 09/09/2024 (Shift-03)

(a) 40°
(b) 23°
(c) 17°
(d) 34°

293. In a ΔABC, the bisectors of ∠ABC and ∠ACB intersect each other at point O. If ∠BOC is 125°, then the ∠BAC is equal to:

SSC CPO 05/10/2023 (Shift-01)

(a) 82°
(b) 78°
(c) 75°
(d) 70°

294. In ΔABC, O is point of intersection of the bisectors of ∠B and ∠A, If ∠BOC = 108°, then ∠BAO is:

SSC CHSL 05/07/2024 (Shift-04)

(a) 26°
(b) 16°
(c) 22°
(d) 18°

295. M is the incentre of the ΔXYZ . If ∠YXZ + ∠YMZ = 150°, then what is the value of ∠YXZ ?

SSC CHSL 14/03/2023 (Shift-03)

(a) 40°
(b) 55°
(c) 60°
(d) 45°

296. M is the incentre of the ΔXYZ. If ∠YXZ + ∠YMZ = 150°, then what is the value of ∠YXZ ?

SSC CHSL 14/03/2023 (Shift-03)

(a) 40°
(b) 55°
(c) 60°
(d) 45°

297. Which of the following is a FALSE statement?

SSC CGL 20/07/2023 (Shift-02)

(a) The circumcentre is the centre of a circle which circumscribes the triangle.
(b) The angle formed by any side at the incentre is always 90° more than the angle at the opposite vertex.
(c) Incentre is the point of concurrency of angle bisectors of a triangle.
(d) Centroid of the triangle divides each median in the ratio of 2:1

298. In a triangle PQR, incentre is A and ∠QAR = 116°. Find the measure of ∠QPR.

SSC CHSL TIER-II (18/11/2024)

(a) 27° (b) 52°
(c) 26° (d) 54°

299. Sides AB and AC of ΔABC are produced to points D and E, respectively. The bisectors of ∠CBD and ∠BCE meet at P. If ∠A=78°, then the measure of ∠P is:

SSC CGL 12/04/2022 (Shift-02)

(a) 51° (b) 61°
(c) 55° (d) 56°

300. The sides AB and AC of ΔABC are produced to points D and E, respectively. The bisectors of ∠CBD and ∠BCE meet at P. If ∠A = 72°, then the measure of ∠P is:

SSC CHSL 10/07/2024 (Shift-03)

(a) 55° (b) 35°
(c) 54° (d) 65°

301. In ΔABC, ∠A = 66°. AB and AC are produced to points D and E, respectively. If the bisectors of ∠CBD and ∠BCE meet at the point O, then ∠BOC is equal to:

SSC CPO 23/11/2020 (Shift-02)

(a) 114° (b) 93°
(c) 57° (d) 66°

302. The sides AB and AC of ΔABC are produced up to points D and E. The bisectors of the exterior angles so formed, intersect each other at point I. If ∠ACB is 66° and ∠ABC = 44°,then what is the measure (in degrees) of ∠BIC?

SSC CHSL 15/04/2021 (Shift-02)

(a) 52 (b) 50
(c) 48 (d) 55

303. An incircle with centre O is drawn inside an equilateral ΔABC and the length of the side is 12 cm. Find the area (in sq. cm) of the triangle which is not in the incircle.

SSC CHSL 13/03/2023 (Shift-02)

(a) 24.64 (b) 21.48
(c) 37.71 (d) 30.64

304. In ΔMNO, XA, XB and XC are perpendicular bisectors on sides MN, ON and OM respectively intersect each other at X. If ∠NMO = 55°, then what is the value of ∠NXO?

SSC CHSL 15/03/2023 (Shift-02)

(a) 130° (b) 110°
(c) 95° (d) 125°

305. ΔABC is inscribed in a circle with centre O. If AB = 35 cm, BC = 12 cm and AC = 37 cm, then what is the circumradius of a triangle?

SSC Phase-XII 21/06/2024 (Shift-02)

(a) 18.5 cm (b) 13.5 cm
(c) 16.5 cm (d) 14.5 cm

306. From the circumcentre L of ΔXYZ, perpendicular LM is drawn on side YZ. If ∠YXZ = 60°, then the measure of ∠YLM is:

SSC CGL 02/12/2022 (Shift-04)

(a) 60° (b) 120°
(c) 180° (d) 90°

307. From a circle of radius r units, the largest equilateral triangle is cut out. What is the length (in units) of the side of the triangle?

SSC CHSL 11/07/2024 (Shift-01)

(a) $\sqrt{2}r$ (b) $\frac{r}{\sqrt{3}}$
(c) $\sqrt{3}r$ (d) $\frac{r}{\sqrt{2}}$

308. ABC is an equilateral triangle. If the area of the triangle is $36\sqrt{3}$ then what is the radius of circle circumscribing the ΔABC ?

(a) $2\sqrt{3}$ (b) $3\sqrt{3}$
(c) $4\sqrt{3}$ (d) $6\sqrt{3}$

309. Find the length of the sides of a triangle, if its angles are in the ratio 2 : 4 : 6 and its circumradius is 12 cm.

SSC CHSL 09/07/2024 (Shift-01)

(a) 5cm, 6cm, 10cm
(b) 15cm, $15\sqrt{3}$ cm, 30cm
(c) 12cm, $12\sqrt{3}$ cm, 24cm
(d) 6cm, $6\sqrt{3}$ cm, 12cm

310. The length of a side of an equilateral triangle is 18 cm. The area (in cm²) of the region lying between the circumcircle and the incircle of the triangle is [use π = 22/7]

SSC CPO 29/06/2024 (Shift-03)

(a) $254\frac{3}{7}$ (b) $254\frac{1}{7}$
(c) $254\frac{2}{7}$ (d) $254\frac{4}{7}$

311. ABC is an isosceles right angle triangle. ∠ABC = 90° and AB = 12 cm. What is the ratio of the radius of the circle inscribed in it to the radius of the circle circumscribing ΔABC?

SSC CGL Tier II (08/08/2022)

(a) $6-3\sqrt{2} : 6\sqrt{2}$ (b) $2-\sqrt{2} : \sqrt{2}$
(c) $6-\sqrt{2} : 3\sqrt{2}$ (d) $6-3\sqrt{2} : \sqrt{2}$

312. An isosceles ΔMNP is inscribed in a circle. If MN = MP = $16\sqrt{5}$cm, and NP = 32cm. What is the radius (in cm) of the circle?

SSC CGL 13/04/2022 (Shift-03)

(a) $20\sqrt{5}$ (b) 18
(c) $18\sqrt{5}$ (d) 20

313. ΔXYZ is an isosceles triangle such that XY = XZ. It is given that YS ⊥ XZ and ZT ⊥ XY. What is the relation between YS and ZT?

SSC Phase-XII 26/06/2024 (Shift-03)

(a) YS = ZT (b) YS = 2 ZT
(c) YS < ZT (d) YS > ZT

314. If in acute angled ΔABC, AL, BM, and CN are the three altitudes of ΔABC then which of the following statements will be true?

SSC CGL 27/07/2023 (Shift-02)

(a) AL + BM + CN = AB + BC + CA
(b) AL + BM = AB + BC
(c) AL + BM + CN > AB + BC + CA
(d) AL + BM + CN < AB + BC + CA

315. In ΔABC, ∠A = 50°, BE and CF are perpendiculars on AC and AB at E and F, respectively. BE and CF intersect at H. The bisectors of ∠HBC and ∠HCB intersect at P. ∠BPC is equal to:

SSC CGL Tier II 03/02/2022

(a) 155° (b) 100°
(c) 115° (d) 120°

316. In ΔABC, ∠A = 66°, BD ⊥ AC and CE ⊥ AB. BD and EC intersect at P. The bisectors ∠PBC and ∠PCB meet at Q. What is the measure of ∠BQC?

SSC CGL 19/04/2022 (Shift-02)

(a) 132° (b) 127°
(c) 147° (d) 143°

317. In ΔABC, ∠A = 52° and O is the orthocentre of the triangle. (BO and CO meet AC and AB at E and F respectively when produced). If the bisectors of ∠OBC and ∠OCB meet at P, then the measure of ∠BPC is :

SSC CGL TIER-II 11/09/2019

(a) 154° (b) 132°
(c) 138° (d) 124°

318. D, E and F are the feet of the perpendiculars from the vertices A, B and C, respectively, of a ΔABC. If ∠BED and ∠BFE (in degrees) are 24° and 110°, respectively, what is the measure (in degrees) of ∠EBF?

SSC CHSL 06/08/2021 (Shift-01)

(a) 55 (b) 67
(c) 46 (d) 86

319. The intersection point of the medians of a triangle is called:

SSC CHSL 20/03/2023 (Shift-03)

(a) Orthocentre (b) Incentre
(c) Circumcentre (d) Centroid

320. In ΔPQR, if PT is the median, then which of the following is correct?

SSC CGL 19/09/2024 (Shift-03)

(a) $PQ^2 + PR^2 = PT^2 + QR^2$
(b) $PQ^2 + PR^2 = 2(PT^2 + QT^2)$
(c) $PQ^2 + PR^2 = 2(PT^2 - QT^2)$
(d) $PQ^2 + PR^2 = PT^2 + QT^2$

321. ΔDEF is an equilateral triangle with a side length of 12 cm. If point G is the mid-point of side DE, what is the length (in cm) of side FG?

SSC CPO 27/06/2024 (Shift-03)

(a) 6 (b) $6\sqrt{3}$
(c) 12 (d) $3\sqrt{6}$

322. In ΔABC, D is the mid point of BC and G is the centroid. If GD = 10 cm, then the length of AD is ______.

SSC Phase-XII 24/06/2024 (Shift-02)

(a) 15 cm (b) 10 cm
(c) 20 cm (d) 30 cm

323. AD is the median of ΔABC. G is the centroid of ΔABC. If AG = 14 cm, then what is the length of AD?

SSC CHSL 13/03/2023 (Shift-01)

(a) 42 cm (b) 28 cm
(c) 35 cm (d) 21 cm

324. L is the centroid of an equilateral ΔPQR. If PQ = 6 cm, then what is the length of PL?

SSC CGL TIER-II 06/03/2023

(a) $5\sqrt{3}$ cm (b) $4\sqrt{3}$ cm
(c) $3\sqrt{3}$ cm (d) $2\sqrt{3}$ cm

325. In ΔABC, AB = 6 cm, AC = 8 cm, and BC = 9 cm. The length of median AD is:

SSC CGL TIER-II 11/09/2019

(a) $\sqrt{\frac{115}{2}}$ cm (b) $\sqrt{\frac{317}{2}}$ cm
(c) $\sqrt{\frac{313}{2}}$ cm (d) $\frac{\sqrt{119}}{2}$ cm

326. In a ΔABC, two medians AD and BE intersect at G at right angles. If AD = 18 cm and BE = 12 cm, then the length of BD is equal to:

SSC CHSL 01/07/2024 (Shift-02)

(a) 10 cm (b) 15 cm
(c) 8 cm (d) 20 cm

327. Two medians JX and KY of ΔJKL intersect each other at Z at right angles. If KL = 22 cm and KY = 12 cm, then what is the length of JX?

SSC CHSL 21/03/2023 (Shift-04)

(a) $6\sqrt{19}$ cm (b) $3\sqrt{57}$ cm
(c) $2\sqrt{57}$ cm (d) $4\sqrt{19}$ cm

328. In ΔABC, two medians AD and BE intersect at G at right angles. If AD = 12 cm and BE = 9 cm, then the length of AB is equal to:

SSC CGL 11/09/2024 (Shift-03)

(a) 14 cm (b) 16 cm
(c) 12 cm (d) 10 cm

329. In ΔABD, C is the midpoint of BD. If AB = 10 cm, AD = 12 cm and AC = 9 cm, then BD = ?

SSC CGL TIER-II 13/09/2019

(a) $2\sqrt{41}$ (b) $2\sqrt{10}$
(c) $\sqrt{41}$ (d) $\sqrt{10}$

330. Two medians NA and OB of ΔNOP intersect each other at S at right angles. If NA = 15 cm and OB = 15 cm, then what is the length of OA?

SSC CHSL 20/03/2023 (Shift-02)

(a) $5\sqrt{5}$ cm (b) $7\sqrt{5}$ cm
(c) $6\sqrt{5}$ cm (d) $3\sqrt{5}$ cm

331. Two medians QT and RS of the ΔPQR intersect at G at right angles. If QT = 18 cm and RS = 27 cm. then the length of QS is:

SSC CHSL 21/03/2023 (Shift-01)

(a) 20 cm (b) 15 cm
(c) 13 cm (d) 10 cm

332. If L is the mid-point of the side YZ of XYZ, and the area of XYL is 13 cm², then the area (in cm²) of XYZ is _____.

SSC CPO 27/06/2024 (Shift-02)

(a) 24 (b) 22
(c) 26 (d) 20

333. If M is the mid point of the side BC of ΔABC, and the area of ΔABM is 18 cm², then the area of ΔABC is :

SSC CHSL 17/03/2020 (Shift-01)

(a) 30 cm² (b) 34 cm²
(c) 36 cm² (d) 32 cm²

334. Let A, B, C be the mid-points of sides PQ, QR, PR respectively, of ΔPQR. If the area of ΔPQR is 32 cm², then find the area of ΔABC.

SSC CGL 18/07/2023 (Shift-01)

(a) 24 cm² (b) 16 cm²
(c) 32 cm² (d) 8 cm²

335. In a ΔXYZ, XO is the median and $XO = \frac{1}{2}YZ$. If $\angle YXO = 30°$, then what is the value of $\angle XYZ$?

SSC CGL 07/12/2022 (Shift-03)

(a) 15° (b) 90°
(c) 30° (d) 60°

336. In ΔSTU, SX is the median on TU. If SX = TX, then what is the value of $\angle TSU$?

SSC CHSL 13/03/2023 (Shift-01)

(a) 75° (b) 45°
(c) 60° (d) 90°

337. In ΔSTU, SE and TF are medians intersect each other at O. If UT = 34 cm, TF = 22.5 cm and SE = 24 cm, then what is the value of $\angle TOE$?

SSC CHSL 21/03/2023 (Shift-03)

(a) 75° (b) 60 °
(c) 45° (d) 90°

338. In a ΔABC, D, E and F are the mid-points of side BC, CA and AB respectively. If BC = 14.4 cm, CA= 15.2 cm and AB = 12.4 cm, what is the perimeter (in cm) of the ΔDEF?

SSC CGL 19/04/2022 (Shift-01)

(a) 42 (b) 28
(c) 21 (d) 35

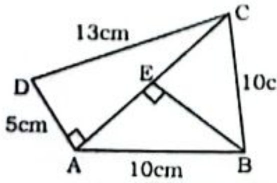
◆ TYPE – V (A) ◆
QUADRILATERALS

339. ABCD is a quadrilateral. The length of diagonal AC is 24 cm. The sum of perpendicular drawn from vertex B and D on the diagonal AC is 10 cm. What is the area of the quadrilateral?

SSC CGL TIER-II 08/08/2022

(a) 240 cm² (b) 120 cm²
(c) 180 cm² (d) 80 cm²

340. What is the area of a quadrilateral ABCD, (shown below) in which sides AB and BC are equal, sides AD and CD are of lengths 5 cm and 13 cm, respectively, and side AD is perpendicular to the diagonal AC?



SSC CHSL 11/07/2024 (Shift-01)

(a) 75cm² (b) 78cm²
(c) 82cm² (d) 80cm²

341. WXYZ is a quadrilateral in which XQ and ZP are perpendicular to WY such that XQ = ZP. Diagonals ZX and WY intersect each other at point O. If OX = 12 cm, then find the value of ZX (in cm).

SSC CGL 19/09/2024 (Shift-01)

(a) 12 (b) 24
(c) 36 (d) 18

342. ABCD is a quadrilateral in which AB || DC. E and F are the midpoints of the diagonals AC and BD, respectively. If AB =18 cm and CD = 6 cm, then EF = ?

SSC CGL TIER-II 29/01/2022

(a) 8 cm (b) 6 cm
(c) 12 cm (d) 9 cm

343. In a quadrilateral ABCD, the bisectors of $\angle C$ and $\angle D$ meet at point E. If $\angle CED = 57°$ and $\angle A = 47°$, then the measure of $\angle B$ is:

SSC CGL 12/04/2022 (Shift-02)

(a) 47° (b) 67°
(c) 77° (d) 57°

344. In a quadrilateral ABCD, AB = BC, AD = DC. $\angle ABD = 68°$, $\angle ADB = (2y - 7)°$, $\angle BDC = 33°$, $\angle DBC = (3x + 2)°$. Then the value of $2x + 3y$ is:

SSC CGL 25/09/2024 (Shift-02)

(a) 108 (b) 144
(c) 104 (d) 118

345. In a square ABCD,E is a point inside the square such that ΔDEC is an equilateral triangle. If E is joined to vertices A and B of the square , what is the degree measure of $\angle AEB$?

SSC CHSL 07/08/2023 (Shift-02)

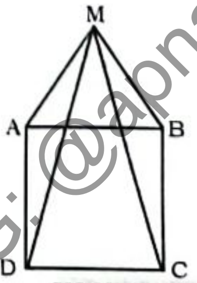
(a) 135° (b) 150°
(c) 210° (d) 225°

346. An equilateral ΔABC surmounts a square BCDE. The value of $\angle EAB + 3\angle AEB$ is:

SSC CGL TIER-II 26/10/2023

(a) 80° (b) 240°
(c) 280° (d) 60°

347. ABCD is a square and ΔMAB is an equilateral triangle. MC and MD are joined. What is the degree measure of $\angle MDC$?



SSC CGL 08/12/2022 (Shift-01)

(a) 78° (b) 60°
(c) 65° (d) 75°

348. A quadrilateral having equal diagonals and equal opposite sides is always a _______.

SSC CHSL TIER-II (18/11/2024)

(a) Trapezium (b) Rhombus
(c) Rectangle (d) Kite

349. The base of a parallelogram is twice as long as its corresponding height. If the area of the parallelogram is 144 cm², find the mentioned height.

SSC CHSL 10/06/2022 (Shift-02)

(a) $2\sqrt{2}$ cm
(b) $6\sqrt{2}$ cm
(c) $3\sqrt{2}$ cm
(d) $8\sqrt{2}$ cm

350. In a rhombus PQRS, O is any interior point such that OP = OR. What is the degree measure of ∠SOQ?

SSC CGL 17/09/2024 (Shift-02)

(a) 120°
(b) 180°
(c) 240°
(d) 200°

351. In a rhombus ABCD, O is any interior point such that OA = OC. What is five-ninths of the degree measure of ∠DOB?

SSC CGL 11/09/2024 (Shift-01)

(a) 120°
(b) 150°
(c) 100°
(d) 90°

352. In a rhombus STUV, S and U are joined ∠SUV = 44°, ∠STU = 92°, what is the degree measure of 4∠SVU – 3∠TSU?

SSC CHSL 04/08/2023 (Shift-02)

(a) 451°
(b) 360°
(c) 169°
(d) 236°

353. If one diagonal of a rhombus is equal to its side, then the diagonals of rhombus are in the ratio of:

SSC CHSL 10/08/2023 (Shift-03)

(a) $\sqrt{3}:\sqrt{6}$
(b) $\sqrt{2}:1$
(c) $\sqrt{2}:\sqrt{3}$
(d) $1:\sqrt{3}$

354. PQ is parallel to SR in a trapezium PQRS. It is given that PQ > SR and the diagonals PR and QS intersect at O. If PO = $3x - 15$, OQ = $x + 9$, OR = $x - 5$ and OS = 5 and x has two values x_1 and x_2 then the value of $(x_1^2 - x_2^2)$ is:

SSC CHSL 03/07/2024 (Shift-03)

(a) 15
(b) 11
(c) 19
(d) 13

355. AB is parallel to DC in a trapezium ABCD. It is given that AB > DC and the diagonals AC and BD intersect at O. If AO = $3x - 15$, OB = $x + 9$, OC = $x - 5$ and OD = 5, and x has two values x_1 and x_2, then the value of $(x_1^2 + x_2^2)$ is:

SSC CHSL 05/07/2024 (Shift-01)

(a) 45
(b) 61
(c) 73
(d) 56

356. ABCD is a trapezium in which AB is parallel to CD, and E and F are the mid-points of non-parallel sides AD and BC. If EF is parallel to AB, AB = 28 cm and CD = 18 cm, the find EF (in cm).

SSC CHSL TIER-II (18/11/2024)

(a) 23
(b) 10
(c) 5
(d) 46

357. In a trapezium ABCD, DC || AB, AB = 16 cm and DC = 11.2 cm. What is the length (in cm) of the line segment joining the mid points of its diagonals?

SSC CHSL 10/08/2021 (Shift-03)

(a) 1.2
(b) 1.8
(c) 2.8
(d) 2.4

358. The lengths of a pair of parallel sides of a trapezium are 20 cm and 25 cm, respectively, and the perpendicular distance between these two sides is 14 cm. What is the area (in cm²) of the trapezium?

SSC CHSL 02/06/2022 (Shift-02)

(a) 512
(b) 250
(c) 300
(d) 315

359. In a trapezium PQRS, PQ is parallel to SR and diagonals PR and QS intersect at O. If PQ = 4 cm, SR = 10 cm, then what is area of (ΔPOQ) : area of (ΔSOR) ?

SSC CGL 18/08/2021 (Shift-02)

(a) 4 : 25
(b) 2 : 3
(c) 4 : 9
(d) 2 : 5

◆ TYPE – V (B) ◆
POLYGON

360. The side BA and DE of a regular pentagon are produced to meet at F. What is the measure of ∠EFA?

CGL 2019 TIER-II 15/11/2020

(a) 72°
(b) 36°
(c) 60°
(d) 54°

361. If the external angle of a regular polygon is 18°, then the number of diagonals in this polygon is:

SSC CGL TIER-II 03/03/2023

(a) 180
(b) 150
(c) 170
(d) 140

362. Find the number of diagonals of a regular polygon whose interior angles sum is 2700°.

SSC CGL TIER-II 06/03/2023

(a) 127
(b) 121
(c) 119
(d) 117

363. If one of the interior angles of a regular polygon is $\frac{15}{16}$ times of one of the interior angles of a regular decagon, then find the number of diagonals of the polygon.

SSC CGL TIER-II 07/03/2023

(a) 20
(b) 14
(c) 2
(d) 35

364. The sum of the interior angles of a regular polygon A is 1260° and each interior angle of a regular polygon B is $128\frac{4°}{7}$. The sum of the number of sides of polygons A and B is:

SSC CGL Tier II 29/01/2022

(a) 18
(b) 16
(c) 19
(d) 17

365. A_1 and A_2 are two regular polygons. The sum of all the interior angles of A_1 is 1080°. Each interior angle of A_2 exceeds its exterior angle by 132°. The sum of the number of sides A_1 and A_2 is:

SSC CGL TIER-II 03/02/2022

(a) 21
(b) 22
(c) 23
(d) 24

366. If the measure of each exterior angle of a regular polygon is $\left(51\frac{3}{7}\right)^{\circ}$, then the ratio of the number of its diagonals to the number of its sides is:

SSC CGL TIER-II 13/09/2019

(a) 5 : 2
(b) 13 : 6
(c) 3 : 1
(d) 2 : 1

367. ABCDEF is a regular hexagon. Side of the hexagon is 36 cm. What is the area of ΔABC?

SSC CGL TIER-II 08/08/2022

(a) $240\sqrt{3}$ cm²
(b) $360\sqrt{3}$ cm²
(c) $192\sqrt{3}$ cm²
(d) $324\sqrt{3}$ cm²

◆ TYPE – VI ◆
CIRCLE

368. If arcs PAQ and RBS of a circle are congruent, then find the ratio of PQ and RS.

SSC CGL 18/09/2024 (Shift-02)

(a) 2 : 3
(b) 1 : 3
(c) 1 : 1
(d) 1 : 2

369. The distance between the longest chord and the centre of a circle is:

SSC CGL 23/09/2024 (Shift-02)

(a) equal to zero unit
(b) equal to the diameter
(c) equal to the half of the radius
(d) equal to the radius

370. If we extend a chord infinitely on both sides, then the chord becomes a _______.

SSC CGL 18/09/2024 (Shift-03)

(a) Diameter
(b) Tangent
(c) Secant
(d) Normal

371. Which of the following statements is INCORRECT?

SSC CGL 14/07/2023 (Shift-03)

(a) If a chord is extended outside the circle on both ends then it is called secant
(b) Tangent is perpendicular to the radius of the circle at the point of contact
(c) A line which intersects two distinct points of a circle is called tangent
(d) Tangent is a line touching only one point of the circle

372. It is always possible to draw a circle passing through _____ non-collinear points in a plane.

SSC CGL 25/09/2024 (Shift-01)

(a) 3
(b) 6
(c) 5
(d) 4

373. A, B, C are three points such that AB = 11 cm, BC = 13 cm and AC = 24 cm. Number of circles passing through the points A, B, C is:

SSC CHSL 03/07/2024 (Shift-02)

(a) 0
(b) 3
(c) 1
(d) 2

374. Which of the following in NOT true regarding a circle ?

SSC CHSL 11/07/2024 (Shift-02)

(a) The largest chord in a circle has a length twice its radius

(b) Given any three points in a plane, there is always a circle passing through these points

(c) The ratio of the perimeter and radius of a circle is always constant

(d) A triangle with vertices on a circle and one side as its diameter is a right-angled triangle

375. Which of the following is a correct statement?

SSC CHSL 01/07/2024 (Shift-01)

(a) The sum of the angles of a cyclic quadrilateral is always 180°.

(b) Equal chords are equidistant from the centre of the circle but not always subtend equal angle at centre of the circle

(c) If two circles touch each other, the point of contact lies on the line joining the two centres.

(d) Angles subtended by the arc in the same segment of the circle are in ratio of 2: 1.

376. Select the INCORRECT statement with respect to the properties of a circle.

SSC CGL 13/12/2022 (Shift-02)

(a) Two tangents drawn at the end of the diameter of a circle are parallel

(b) The radius drawn perpendicular to a chord bisects the chord

(c) The diameter of a circle is the longest chord of a circle

(d) The perpendicular distance from the centre of a circle increases when the length of a chord increases

377. The area of a circle is 256π square cm. The length of its longest chord (in cm) is:

SSC CPO 29/06/2024 (Shift-03)

(a) 34 (b) 36

(c) 16 (d) 32

378. In a circle with centre O, AOC is the diameter. B is a point on the circumference of the circle such that arc AB is $\frac{1}{5}$ of the arc BC. What is the degree measure of ∠BOC?

SSC CGL 18/09/2024 (Shift-01)

(a) 120° (b) 150°

(c) 80° (d) 30°

379. If in a circle a chord of length 14 cm is at a distance of 24 cm from its centre, then the length of the radius of the circle is:

SSC CGL 23/09/2024 (Shift-03)

(a) 28 cm (b) 31 cm

(c) 24 cm (d) 25 cm

380. The length of a chord made on an arc of a circle is equal to the radius of the circle. The length of the arc is _____(in units), if the radius of the circle is 21 units. (Take π = 22/7)

SSC CPO 27/06/2024 (Shift-01)

(a) 20 (b) 22

(c) 24 (d) 21

381. A circle's centre is connected to its 50 cm long chord by a perpendicular that is 21 cm long. Find the circle's radius.

SSC CGL 13/09/2024 (Shift-02)

(a) $\sqrt{1065}$ cm (b) $\sqrt{1068}$ cm

(c) $\sqrt{1064}$ cm (d) $\sqrt{1066}$ cm

382. A chord of length 32 cm is drawn at a distance of 12 cm from the centre of a circle. Find the radius of the circle?

SSC CGL 18/09/2024 (Shift-01)

(a) 18 cm (b) 22 cm

(c) 20 cm (d) 28 cm

383. One chord of a circle is given as 20.5 cm. Then the radius (r) of the circle must be:

SSC CGL TIER-II 26/10/2023

(a) r > 10.25 (b) r ≥ 10.25

(c) r < 10.25 (d) r = 10cm

384. In a circle of radius $5\sqrt{13}$ cm, a chord is at a distance of 10 cm from the centre of the circle. Find the length (in cm) of the chord.

SSC CGL 10/09/2024 (Shift-02)

(a) 30 (b) 28

(c) 36 (d) 15

385. The radius of the circle is 10 cm and the perpendicular distance from the chord to the centre is 6 cm. The length of the chord is:

SSC CGL 19/09/2024 (Shift-02)

(a) 16 cm (b) 12 cm

(c) 14 cm (d) 18 cm

386. A chord of length 12 units in a circle of radius 10 units is _____ units away from its centre.

SSC CHSL 05/07/2024 (Shift-02)

(a) 9 (b) 8

(c) 10 (d) 6

387. X and Y are two points on the circumference of a circle having diameter 20 cm. The length of the line segment XY is 16 cm. Find the distance (in cm) of the line segment XY from the centre of the circle.

SSC CHSL 08/07/2024 (Shift-02)

(a) 4 (b) 3

(c) 6 (d) 5

388. The radius of a circle is 12.5 cm and the length of one its chords is 11 cm. What is the distance of the chord from the centre? (correct to one decimal place)

SSC CGL 24/09/2024 (Shift-01)

(a) 11.2 cm (b) 13.2 cm

(c) 10 cm (d) 12 cm

389. Two points P and Q are 3 cm apart. These two points lie on the circumference of a circle having radius 1.7 cm. What is the distance (in cm) of the line segment PQ from the centre of the circle?

SSC CHSL 09/08/2023 (Shift-04)

(a) 0.8 (b) 1.0

(c) 0.4 (d) 0.6

390. PQ is a diameter of a circle and PS is a chord. If PQ is 82 cm and PS is 80 cm, the distance (in cm) of PS from the center of the circle is:

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 39 (b) 18

(c) 9 (d) 24

391. A circle with centre O has radius 15 cm. D is a point on the circle such that a 24 cm long chord AB is bisected by OD at point C. Find the length of CD (in cm).

SSC CGL 18/04/2022 (Shift-03)

(a) 9 (b) 10

(c) 4 (d) 6

392. If the area of a circle is 616 cm^2 and a chord XY = 10 cm, then find the perpendicular distance from the center of the circle to the chord XY.

SSC CGL 17/07/2023 (Shift-01)

(a) $\sqrt{171}$ cm (b) $\sqrt{161}$ cm

(c) $\sqrt{117}$ cm (d) $\sqrt{181}$ cm

393. A circle with centre O has chord AB that is 20 cm in length. If the radius of the circle is 12 cm, then the area of triangle AOB is:

SSC CHSL 02/08/2023 (Shift-03)

(a) $20\sqrt{15}cm^2$ (b) $22\sqrt{11}cm^2$

(c) $20\sqrt{11}cm^2$ (d) $22\sqrt{15}cm^2$

394. On a circle of radius 7 units, PQ and QR are chords of length 7 units each. What is the length of the chord PR in units?

SSC CGL 18/09/2024 (Shift-02)

(a) $\frac{28}{\sqrt{3}}$ (b) $\frac{7}{\sqrt{3}}$

(c) $\frac{14}{\sqrt{3}}$ (d) $\frac{21}{\sqrt{3}}$

395. Two parallel chords of length 8 units each are 6 units away from each other in a circle. What is the radius of the circle in units?

SSC CHSL 03/07/2024 (Shift-04)

(a) 3 (b) 6

(c) 5 (d) 4

396. AB and CD are two parallel chords drawn in a circle with centre O. The distance between the two chords is 21 cm. If the lengths of AB and CD are 24 cm and 18 cm, respectively, then the radius of the circle is equal to:

SSC CGL 17/09/2024 (Shift-02)

(a) 15 cm (b) 20 cm

(c) 18 cm (d) 24 cm

397. AB = 8 cm and CD = 6 cm are two parallel chords on the same side of the centre of a circle. If the distance between them is 2 cm then the radius (in cm) of the circle is:

SSC CHSL 02/08/2023 (Shift-04)

(a) $\frac{\sqrt{265}}{4}$ (b) $\frac{\sqrt{256}}{16}$

(c) $\frac{\sqrt{156}}{4}$ (d) $\frac{\sqrt{198}}{4}$

398. PQ and RS are two chords of a circle such that PQ = 12 cm and RS = 20 cm and PQ is parallel to RS. If the distance between PQ and RS is 4 cm, find the diameter of the circle.

SSC CHSL 09/07/2024 (Shift-02)

(a) $2\sqrt{34}$ cm (b) $3\sqrt{34}$ cm

(c) $6\sqrt{34}$ cm (d) $4\sqrt{34}$ cm

399. Let O be the centre of the circle and AB and CD are two parallel chords on the same side of the radius. OP is perpendicular to AB and OQ is perpendicular to CD. If AB = 10 cm, CD = 24 cm and PQ = 7 cm, then the diameter (in cm) of the circle is equal to:

SSC CGL 09/09/2024 (Shift-01)

(a) 26 (b) 13

(c) 12 (d) 24

400. A circle of diameter 26 cm has two equal chords of length 10 cm each, separated by a distance h cm. What is the value of h?

SSC CHSL 04/07/2024 (Shift-03)

(a) 16 (b) 12

(c) 18 (d) 24

401. A circle of diameter 26 cm has two equal parallel chords of length 10 cm each, then the distance between thetwo chords is:

SSC CHSL 03/07/2024 (Shift-02)

(a) 26 cm (b) 23 cm

(c) 24 cm (d) 21 cm

402. Two parallel chords are drawn in a circle of radius 25 cm. The distance between the two chords is 27 cm. If the length of one chord is 48 cm, then length of the other chord is equal to:

SSC CHSL 05/07/2024 (Shift-03)

(a) 42 cm (b) 36 cm

(c) 48 cm (d) 30 cm

403. Two parallel chords of length 5 units and 8 units are on opposite sides of the center of a circle of radius 7 units. What is the distance between the chords? (Round your answer to two decimal places)

SSC CHSL 04/07/2024 (Shift-04)

(a) 11.82 units (b) 12.28 units

(c) 11.28 units (d) 12.82 units

404. Two parallel chords on the same side of the centre of a circle are 12 cm and 20 cm long and the radius of the circle is $5\sqrt{13}$ cm. What is the distance between the chords?

SSC CHSL 01/07/2024 (Shift-01)

(a) 3 cm (b) 5 cm

(c) 2 cm (d) 4 cm

405. In a circle of radius 3 cm, two chords of length 2 cm and 3 cm lie on the same side of a diameter. What is the perpendicular distance between the two chords?

SSC CGL 09/12/2022 (Shift-02)

(a) $\frac{4\sqrt{3}-3\sqrt{2}}{2}$ cm

(b) $\frac{4\sqrt{2}-3\sqrt{3}}{2}$ cm

(c) $\frac{4\sqrt{2}-3\sqrt{3}}{3}$ cm

(d) $\frac{4\sqrt{2}-3\sqrt{3}}{4}$ cm

406. AB = 28 cm and CD = 22 cm are two parallel chords on the same side of the centre of a circle. The distance between them is 4 cm. the radius of the circle is ___. (Consider up to two decimals)

SSC CGL 21/07/2023 (Shift-02)

(a) 15.20 cm (b) 14.82 cm

(c) 15.82 cm (d) 13.20 cm

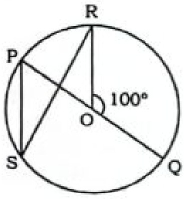
407. Point D, E and F all lie on the circumference of a circle with centre O. If ∠DEF = 48°, then what is a possible value of ∠DOF?

SSC CHSL 13/03/2023 (Shift-03)

(a) 84° (b) 96°

(c) 90° (d) 48°

408. In the figure given below, PQ is the diameter of circle with centre O if ∠QOR = 100° then the measure of ∠PSR is:



SSC CGL 25/07/2023 (Shift-04)

(a) 160 (b) 80

(c) 40 (d) 100

409. O is the centre of a circle and A is a point on a major arc BC of the circle. ∠ABO = 40° and ∠ACO = 30°, then find ∠BOC.

SSC CHSL 03/08/2023 (Shift-01)

(a) 130° (b) 140°

(c) 120° (d) 150°

410. Points A and B are on a circle with centre O. Point C is on the major arc AB. If ∠OAC = 35° and ∠OBC = 45°, then what is the measure (in degree) of the angle subtended by the minor arc AB at the centre?

SSC CGL 18/08/2021 (Shift-03)

(a) 80° (b) 70°

(c) 100° (d) 160°

411. Let C be a circle with centrer O and AB be a chord of C such that the length of AB is equal to the radius of C. Let D be any point on major arc of AB. Find ∠AOB and ∠ADB, respectively.

SSC CHSL 08/07/2024 (Shift-01)

(a) 120° ; 100° (b) 100° ; 80°

(c) 60° ; 30° (d) 90° ; 60°

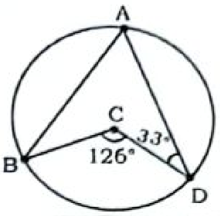
412. O is the centre and the arc PQR subtends an angle of 240° at O. PQ is extended to A. Then ∠AQR is:

SSC CHSL 02/07/2024 (Shift-01)

(a) 180° (b) 60°

(c) 240° (d) 120°

413. Given is a circle with centre at C. A, B and D are the points on the circumference. Find ∠ABC.



SSC CHSL 01/07/2024 (Shift-04)

(a) 30° (b) 37°

(c) 35° (d) 33°

414. PQ is the diameter of a circle with centre O. PT is a tangent touching the circle at P. The secant QT intersects the circle at S. O and S are joined. If ∠SOP = 104°, what is the measure (in degrees) of ∠PTQ?

SSC CHSL 09/07/2024 (Shift-02)

(a) 45 (b) 62

(c) 76 (d) 38

415. In a circle, O is the centre and AOB is the diameter. AT is a tangent to the circle. Line TB intersects the circle at Q. Given that ∠AOQ = 94°, find ∠ATQ.

SSC CHSL 04/07/2024 (Shift-04)

(a) 86° (b) 43°

(c) 47° (d) 133°

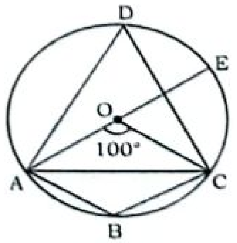
416. Minor arc BC subtends ∠BAC and ∠BDC at points A and D respectively, on the circumference in the major sector of the circle with centre O. What is the value (in degrees) of ∠ABC + ∠ACB, if ∠BDC = 73°?

SSC CHSL 03/08/2023 (Shift-04)

(a) 117° (b) 107°

(c) 103° (d) 113°

417. In the given figure, O is the centre of the circle, AE is the diameter and ∠AOC = 100°.



The value of ∠CDE + ∠CEA is:

SSC CHSL 04/07/2024 (Shift-01)

(a) 90°

(b) 80°

(c) 60°

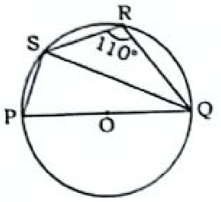
(d) 100°

418. MN, is the diameter of a circle with center O. P and S are two points on the circumference of the circle on both sides of MN such that ∠PMN = 50° and ∠MNS = 35°. What will be the measure of the degree of difference between ∠PMS and ∠PNS?

SSC CHSL 04/08/2023 (Shift-03)

(a) 30° (b) 25°
(c) 55° (d) 65°

419. In the given figure, PQ is a chord passing through the centre 'O' of the circle. Calculate ∠PQS.



SSC CGL 21/07/2023 (Shift-04)

(a) 40° (b) 60°
(c) 20° (d) 80°

420. AB is the diameter of a circle with centre O. C and D are two points on the circle on opposite side of AB, such that ∠CAB = 52° and ∠ABD = 47°. What is the difference (in degrees) between the measures of ∠CAD and ∠CBD?

SSC CGL 21/04/2022 (Shift-02)

(a) 10 (b) 20
(c) 25 (d) 15

421. In a circle with centre O, AB is the diameter and CD is a chord such that ABCD is a trapezium. If ∠BAC = 40°, then ∠CAD is equal to:

SSC CGL 10/06/2019 (Shift-02)

(a) 15° (b) 20°
(c) 50° (d) 10°

422. A quadrilateral PQRS is inscribed in a circle of centre O, such that PQ is a diameter and ∠PSR = 120°. Find the value of ∠QPR.

SSC CGL 19/09/2024 (Shift-02)

(a) 30° (b) 60°
(c) 40° (d) 50°

423. In a circle with centre O, chords PR and QS meet at the point T, when it is produced, and PQ is a diameter. If ∠ROS = 42°, then the measure of ∠PTQ is:

SSC CGL 11/04/2022 (Shift-02)

(a) 59° (b) 58°
(c) 48° (d) 69°

424. If two tangents to a circle of radius 3 cm are inclined to each other at angle of 60°, then the length of each tangent is:

SSC CPO 09/11/2022 (Shift-02)

(a) $\frac{3\sqrt{3}}{4}$ cm (b) $3\sqrt{3}$ cm
(c) 3 cm (d) 6 cm

425. The radii of two concentric circles are 26 cm and 10 cm. If the chord of the greater circle is a tangent to the smaller circle, then find the length of that chord.

SSC CGL 24/09/2024 (Shift-02)

(a) 38.7 cm (b) 28.7cm
(c) 48 cm (d) 28 cm

426. Consider two concentric circles having radii 17 cm and 15 cm. What is the length (in cm) of the chord, of the bigger circle, which is a tangent to the smaller circle?

SSC CHSL 02/07/2024 (Shift-02)

(a) 16 (b) 10
(c) 12 (d) 8

427. Out of two concentric circles, the radius of the outer circle is 6 cm and the chord PQ of the length 10 cm is a tangent to the inner circle. Find the radius (in cm) of the inner circle.

SSC CPO 05/10/2023 (Shift-02)

(a) $\sqrt{11}$ (b) $\sqrt{7}$
(c) $\sqrt{13}$ (d) 4

428. The radii of two concentric circles are 35 cm and 21 cm. If the chord of the greater circle is a tangent to the smaller circle, then the length of that chord is:

SSC CHSL 05/07/2024 (Shift-02)

(a) 70 cm (b) 42 cm
(c) 56 cm (d) 28 cm

429. Two circles of radii 12 cm and 13 cm are concentric. The length of the chord of the larger circle which touches the smaller circle is:

SSC CHSL 02/08/2023 (Shift-01)

(a) 8 cm (b) 18 cm
(c) 10 cm (d) 12 cm

430. C_1 and C_2 are two concentric circles such that the radius of C_2 is less than the radius of C_1. If AB is the chord of C_1 of length 12 cm, touching C_2 at P, find the length of AP

SSC CGL 20/07/2023 (Shift-01)

(a) 9 cm (b) 10.5 cm
(c) 8 cm (d) 6 cm

431. Two circles touch each other internally. Their radii are 3 cm and 4 cm. What is the length of the biggest chord of the circle with radii 4 cm which is outside the inner circle?

SSC CHSL 17/08/2023 (Shift-03)

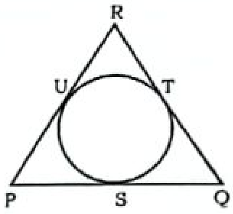
(a) $5\sqrt{3}$ cm (b) $6\sqrt{3}$ cm
(c) $2\sqrt{3}$ cm (d) $4\sqrt{3}$ cm

432. The radii of two concentric circles are x cm and 26 cm. P and S are the points on larger circle and Q and R are points On smaller circle. If PQRS is a straight line and QR = 40 cm and PS = 48 cm, then what is the value of x? ($x < 26$ cm)

SSC CHSL 09/03/2023 (Shift-04)

(a) $11\sqrt{5}$ (b) $10\sqrt{5}$
(c) $12\sqrt{5}$ (d) $9\sqrt{5}$

433. In the given figure, a circle inscribed in ΔPQR touches its sides PQ, QR and RP at points S, T and U, respectively. If PQ = 15 cm, QR = 10 cm, and RP = 12 cm, then find the lengths of PS, QT and RU?



SSC CGL 07/03/2020 (Shift-03)

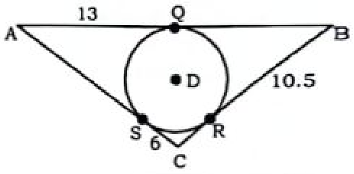
(a) PS = 3.5 cm, QT = 6.5 cm and RU = 8.5 cm
(b) PS = 6.5 cm, QT = 8.5 cm and RU 3.5 cm
(c) PS = 8.5 cm, QT = 3.5 cm and RU 6.5 cm
(d) PS = 8.5 cm, QT = 6.5 cm and RU = 3.5 cm

434. A circle is inscribed in a ΔABC. It touches sides AB, BC and AC at points R, P and Q, respectively. If AQ = 3.5 cm, PC = 4.5 cm and BR=7 cm, then the perimeter (in cm) of ΔABC is:

SSC CPO 23/11/2020 (Shift-01)

(a) 45 (b) 28
(c) 15 (d) 30

435. ΔABC is circumscribed around circle D. Segments AQ, BR and SC measure 13, 10.5 and 6 cm, respectively. The perimeter of ΔABC is:



SSC CGL 26/07/2023 (Shift-04)

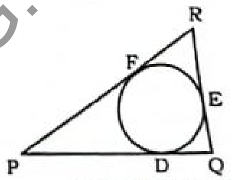
(a) 29.5 cm (b) 59 cm
(c) 108 cm (d) 15 cm

436. A circle is inscribed in ΔABC, touching AB at P, BC at Q and AC at R. If AR = 5 cm, RC = 6 cm and AB = 12 cm, then perimeter of ΔABC is:

SSC CGL 06/06 /2019 (Shift-01)

(a) 40 cm (b) 32 cm
(c) 37 cm (d) 36 cm

437. In the given figure, a circle is inscribed in ΔPQR, such that it touches the sides PQ, QR and RP at points D, E, F, respectively. If the lengths of the sides PQ= 15 cm, QR = 11cm and RP = 13cm, then find the length of PD.



SSC CGL 02/12/2022 (Shift-01)

(a) 9 cm
(b) 8 cm
(c) 7.5 cm
(d) 8.5 cm

438. A circle is inscribed in ΔPQR touching the sides QR, PR and PQ at the points S, U and T, respectively. PQ = (QR + 5) cm, PQ = (PR + 2) cm. If the perimeter of ΔPQR is 32 cm, then PR is equal to:

SSC CGL TIER-II 29/01/2022

(a) 10 cm (b) 13 cm
(c) 11 cm (d) 8 cm

439. A circle is inscribed in ΔABC, touching AB, BC and AC at the points P, Q and R respectively. If AB - BC = 4cm, AB – AC = 2 cm and the perimeter of ΔABC = 32 cm, then PB + AR is equal to:

SSC CGL TIER-II 11/09/2019

(a) $\frac{33}{5}$ cm (b) 13 cm
(c) $\frac{38}{3}$ cm (d) 12 cm

440. The sides AB, BC and AC of ΔABC are 12 cm, 8 cm and 10 cm, respectively. A circle is inscribed in the triangle touching AB, BC and AC at D, E and F, respectively. The ratio of the lengths of AD to CE is:

SSC CHSL 10/08/2021 (Shift-03)

(a) 5 : 7 (b) 3 : 5
(c) 10 : 7 (d) 7 : 3

441. A circle touches the side BC of ΔABC at P and also touches AB and AC produced at Q and R, respectively. If the perimeter of ΔABC = 14.1 cm, then the length (in cm) of AQ will be:

SSC CHSL 09/08/2021 (Shift-01)

(a) 10.3 (b) 9.15
(c) 6.25 (d) 7.05

442. A is a point outside of a circle with centre O. AP and AQ are two tangents of the circle. If AP = a^2 + 14 and AQ = 239, then what is the value of a?

SSC CHSL 20/03/2023 (Shift-01)

(a) 22 (b) 13
(c) 15 (d) 14

443. From an external point A, two tangents AB and AC have been drawn to a circle touching the circle at B and C respectively. P and Q are points on AB and AC respectively such that PQ touches the circle at R. If AB = 11 cm, AP = 7 cm and AQ = 9 cm, then find the length of PQ (in cm).

SSC CGL 16/08/2021 (Shift-02)

(a) 8 (b) 7
(c) 5 (d) 6

444. ΔABC has sides 5cm, 6cm and 7cm. Side BC of the triangle touches the circle, AB when extended touches the circle at P and AC when extended touches the same circle at Q. Find the length (in cm) of AQ.

SSC CGL 17/08/2021 (Shift-01)

(a) 13 (b) 12
(c) 9 (d) 11

445. A circle is inscribed in a quadrilateral ABCD touching sides AB, BC, CD and AD at the points P, Q, R and S respectively. If BP = 4 cm, SD = 6 cm and BC = 7 cm, then the length of DC is:

SSC CGL 07/06/2019 (Shift-01)

(a) 8 cm (b) 9 cm
(c) 10 cm (d) 7 cm

446. A circle touches all four sides of a quadrilateral ABCD. If AB = 18 cm, BC = 21 cm and AD = 15 cm, then length CD is:

SSC CGL TIER-II 02/03/2023

(a) 16 cm (b) 14 cm
(c) 12 cm (d) 18 cm

447. A circle touches all the four sides of quadrilateral ABCD whose sides are AB = 8.4 cm, BC= 9.8 cm and CD = 5.6 cm The length of side AD, in cm is:

SSC CGL 13/08/2021 (Shift-03)

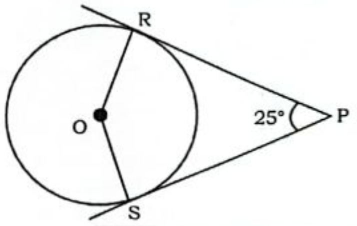
(a) 4.9 (b) 4.2
(c) 3.8 (d) 2.8

448. A circle is inscribed in a quadrilateral ABCD, touching sides AB, BC, CD and DA at P, Q, R and S, respectively. If AS = 6 cm, BC = 12 cm, and CR = 5 cm, then the length of AB (in cm) is:

SSC CGL 23/08/2021 (Shift-01)

(a) 13 (b) 11
(c) 15 (d) 12

449. In the given figure, if ∠RPS = 25°, the value of ∠ROS is ________.



SSC CHSL 27/05/2022 (Shift-02)

(a) 155° (b) 145°
(c) 135° (d) 165°

450. PM and PN are two tangents of a circle from an external point P. M and N are points on the circle. If PM = y^2 – 9 and PN = 55, then what is the value of y?

SSC CHSL 13/03/2023 (Shift-04)

(a) 64 (b) 17
(c) 8 (d) 12

451. AB is a chord in the minor segment of a circle with centre O. C is a point on the minor arc (between A and B). The tangents to the circle at A and B meet at a point P. If ∠ACB = 108°, then ∠APB is equal to:

SSC CGL Tier II 03/02/2022

(a) 36° (b) 54°
(c) 27° (d) 18°

452. AB is a chord of a circle in minor segment with centre O. C is a point on the minor arc of the circle between the points A and B. The tangents to the circle at A and B meet at the point P. If ∠ACB = 102°, then what is the measure of ∠APB?

SSC CGL 18/08/2021 (Shift-01)

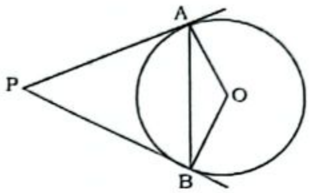
(a) 27° (b) 29°
(c) 24° (d) 23°

453. A and B are two points on a circle with centre O. C is a point on the minor arc of the circle between points A and B. The tangents to the circle at A and B meet each other at a point D. If ∠ADB = 25°, then ∠ACB (in degrees) is equal to:

SSC CHSL 16/04/2021 (Shift-02)

(a) 102.5 (b) 100.5
(c) 100 (d) 105

454. In the given figure, if PA and PB are tangents to the circle with centre O such that ∠APB = 54°, then ∠OBA = _____.



SSC CGL 12/12/2022 (Shift-04)

(a) 27° (b) 40°
(c) 30° (d) 35°

455. PS and PT are two tangents from a point P outside the circle with centre O. If S and T are points on the circle such that ∠SPT = 130°, then the degree measure of ∠OS Tis equal to:

SSC CHSL 04/08/2023 (Shift-02)

(a) 25° (b) 55°
(c) 65° (d) 35°

456. From an external point A, tangents AP and AQ are drawn on a circle with centre O. If ∠APQ = 40°, then find ∠POQ.

SSC CPO 27/06/2024 (Shift-01)

(a) 110° (b) 100°
(c) 60° (d) 80°

457. AP and AQ are two tangents drawn to a circle with center O from an external point A. If ∠PAQ = 40°, then ∠POQ is:

SSC CGL 17/09/2024 (Shift-01)

(a) 120° (b) 130°
(c) 150° (d) 140°

458. If PQ and PR are the two tangents to a circle with center O, and ∠QOR = 150°, then ∠QPR is equal to:

SSC CHSL 01/07/2024 (Shift-01)

(a) 45° (b) 90°
(c) 60° (d) 30°

459. Let C be a circle with Centre O and P be an external point to C. Let PQ and PR be the tangents to C such that Q and R be the points of tangency, respectively. If ∠ROQ = 110°, find ∠RPQ.

SSC CHSL 02/07/2024 (Shift-03)

(a) 90° (b) 70°
(c) 80° (d) 110°

460. AB and AC are two tangents to a circle having centres at the point X. What will be the measure of ∠BAC, if ∠BXC= 125°?

SSC CHSL 02/07/2024 (Shift-03)

(a) 52° (b) 50°
(c) 55° (d) 48°

461. If TM and TN are the two tangents to a circle with centre O so that ∠MON= 105°, then ∠MTN will be equal to:

SSC CHSL 07/08/2023 (Shift-04)

(a) 70° (b) 60°
(c) 75° (d) 85°

462. Let C be a circle with centre O and P be an external point to C. Let PA and PB be two tangents to C with A and B being the points of tangency, respectively. If PA and PB are inclined to each other at an angle of 60°, then find ∠POA?

SSC CGL 09/09/2024 (Shift-02)

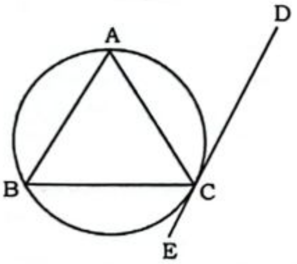
(a) 40° (b) 60°
(c) 80° (d) 30°

463. Points A and B are on a circle with centre O. PA and PB are tangents to the circle from an external point P. If PA and PB are inclined to each other at 42°, then find the measure of ∠OAB.

SSC CGL 20/04/2022 (Shift-01)

(a) 42° (b) 69°
(c) 21° (d) 25°

464. In the following figure, ΔABC is an inscribed triangle as shown and DE is a tangent to the circle at C. Which of the angles from the given options is necessarily equal to ∠ACD?



SSC CHSL 25/05/2022 (Shift-01)

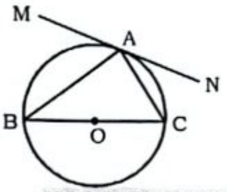
(a) ∠BAC
(b) ∠BCE
(c) ∠ABC
(d) ∠BCA

465. AB is a diameter of a circle with centre O. The tangent at a point C on the circle and AB, when produced, meet at the point P. If ∠APC = 38°, then what is the measure of ∠PCB?

SSC CGL 18/04/2022 (Shift-03)

(a) 19° (b) 23°
(c) 26° (d) 29°

466. In the following figure, MN is a tangent to a circle with centre O at point A. If BC is a diameter and ∠ABC = 42°, then find the measure of ∠MAB .



SSC CGL 19/04/2022 (Shift-01)

(a) 84° (b) 48°
(c) 42° (d) 45°

467. AB is a chord of a circle with centre O, while PAQ is the tangent at A. R is a point on the minor arc AB. If ∠BAQ = 70°, then find the measure of ∠ARB.

SSC CGL 18/04/2022 (Shift-02)

(a) 125° (b) 145°
(c) 70° (d) 110°

468. AB is a chord of the circle and AOC is its diameter such that ∠ACB = 65°. If AT is the tangent to the circle at the point A, then ∠BAT is equal to:

SSC CHSL 02/08/2023 (Shift-04)

(a) 65° (b) 75°
(c) 6 (d) 8

469. In a circle with centre O, PAX and PBY are the tangents to the circle at points A and B, from an external point P. Q is any point on the circle such that ∠QAX = 59° and ∠QBY = 72°. What is the measure of ∠AQB?

SSC CGL 17/08/2021 (Shift-01)

(a) 31° (b) 72°
(c) 59° (d) 49°

470. A pair of straight lines from an external point F intersects a circle at A and B (FA < FB), and touches the circle at C. O is the centre of the circle. Given that ∠ACF = 50° and ∠AFC = 30°, find ∠AOB.

SSC CGL 12/09/2024 (Shift-03)

(a) 80° (b) 90°
(c) 100° (d) 40°

471. Points A and B are on a circle with centre O. PAM and PBN are tangents to the circle at A and B respectively from a point P outside the circle. Point Q is on the major arc AB such that ∠QAM = 58° and ∠QBN = 50°, then find the measure (in degree) of ∠APB.

SSC CGL 17/08/2021 (Shift-03)

(a) 30 (b) 32
(c) 36 (d) 40

472. In a circle with centre O, a diameter AB is produced to a point P lying outside the circle and PT is a tangent to the circle at a point C on it. If ∠BPT = 28°, then what is the measure of ∠BCP?

SSC CGL 24/08/2021 (Shift-03)

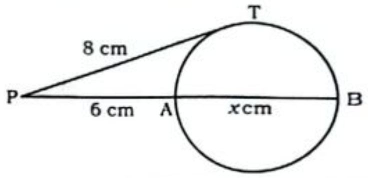
(a) 28° (b) 31°
(c) 62° (d) 45°

473. Two chords AB and CD of a circle are produced to intersect each other at a point P outside the circle. If AB = 7 cm, BP = 4.2 cm and PD = 2.8 cm, then the length of CD is:

SSC CHSL 10/07/2024 (Shift-04)

(a) 11 cm (b) 18 cm
(c) 16 cm (d) 14 cm

474. In the given figure, PAB is a secant and PT is a tangent to the circle from P. If PT = 8 cm, PA = 6 cm and AB = x cm, then the value of x is:



SSC CGL 14/07/2023 (Shift-01)

(a) $\frac{14}{9}$ (b) $\frac{1}{3}$
(c) $\frac{14}{3}$ (d) $\frac{4}{3}$

475. A line from point A is drawn that is tangent to the circle at point B. A secant is also drawn from point A to the circle intersecting it at points C and D. If AB = 42 cm and AC = 21 cm, then what is the ratio between AB and CD?

SSC CHSL 10/07/2024 (Shift-02)

(a) 2 : 5 (b) 2 : 3
(c) 3 : 2 (d) 3 : 4

476. A tangent is drawn from a point at a distance of 25cm from the Centre of a circle C(0, r) of radius 7cm. The length of the tangent is ___ cm.

SSC CHSL 09/07/2024 (Shift-03)

(a) 24 (b) 8
(c) 20 (d) 16

477. $\overline{CT}$ is a tangent to a circle at the point T on the circle. Chord $\overline{AB}$ of the circle is extended to meet the tangent $\overline{CT}$ at the point C. If m$\left(\overline{AB}\right)$ = 3 cm and m$\left(\overline{BC}\right)$ = 2.4 cm, find the length (in cm) of the tangent $\overline{CT}$.

SSC CHSL 14/08/2023 (Shift-01)

(a) 4.2 (b) 3.6
(c) 3.2 (d) 4.0

478. The secant CD intersects the circle at E and CF is tangent to the circle at F. If the length of the secant CD is equal to 20 cm and the length of tangent CF is 15 cm, find the length of the chord DE.

SSC CPO 29/06/2024 (Shift-02)

(a) 3.75 cm (b) 11.25 cm
(c) 9.25 cm (d) 8.75 cm

479. A tangent AB at point A of a circle of radius 6 cm meets a line through the centre O at point OB If OB = 10 cm, then the length of AB (in cm) is equal to:

SSC CHSL 02/08/2023 (Shift-01)

(a) 5 (b) 6
(c) 4 (d) 8

480. A tangent is drawn from a point P that is at a distance of 37 cm from center of the circle O, and diameter is 24 cm. The length (in cm) of the tangent is:

SSC CHSL 09/07/2024 (Shift-03)

(a) 30 (b) 35
(c) 28.16 (d) 37

481. The length of the tangent drawn from a point 10 cm away from the centre of a circle with radius 4 cm, is:

SSC CGL 23/09/2024 (Shift-03)

(a) $3\sqrt{14}$ (b) $3\sqrt{21}$
(c) $2\sqrt{21}$ (d) $2\sqrt{14}$

482. In a circle centred at O, PQ is a tangent at P. Furthermore, AB is the chord of the circle and is extended to Q. If PQ = 12 cm and QB = 8 cm, then the length of AB is equal to:

SSC CPO 04/10/2023 (Shift-02)

(a) 8 cm (b) 20 cm
(c) 4 cm (d) 10 cm

483. From a point A, a tangent line is drawn to the circle of radius 7 units. From the same point, a secant is drawn to the circle which cuts the circle at B and C and the point B is near A than C. What is the length of BC in units if the length of the tangent to the circle from point A is 21 units and the length of AB is 14 units?

SSC CGL 19/09/2024 (Shift-03)

(a) 18.5 (b) 16.5
(c) 15.5 (d) 17.5

484. The radius of the circle is 8 cm. The distance of a point lying outside the circle from the centre is 17 cm. The length of the tangent drawn from the outside point to the circle is:

SSC CGL 13/09/2024 (Shift-02)

(a) 18 cm (b) 15 cm
(c) 16 cm (d) 19 cm

485. In a circle with centre O, ABC is a secant intersection the circle at A and B and DC is a tangent to the circle at D. If DC = 12 cm and BC = 6 cm, then the length of AB is equal to:

SSC CHSL 03/07/2024 (Shift-01)

(a) 20 cm (b) 18 cm
(c) 22 cm (d) 16 cm

486. PQ is a chord of a circle. The tangent XR at point X on the circle intersects the extension of PQ at point R. Given that XR = 12 cm, PQ = x cm, and QR = $(x - 2)$ cm, find the value of x.

SSC CHSL 05/07/2024 (Shift-02)

(a) 11 cm (b) 9 cm
(c) 8 cm (d) 10 cm

487. From a point T, the length of the tangent to a circle is 32 cm and the distance of T from the centre is 40 cm. The diameter (in cm) of the circle is:

SSC CGL 12/09/2024 (Shift-02)

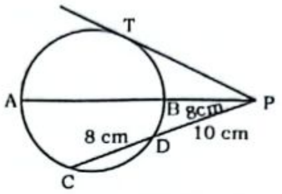
(a) 36 (b) 16
(c) 32 (d) 48

488. PQ is a chord of a circle. The tangent to the circle X at the point XR intersects the produced side PQ at R. If XR = 12cm, PQ = x cm, QR = $x - 2$ cm,, then find the value of x (in cm).

SSC CHSL 04/08/2023 (Shift-03)

(a) 10 (b) 6
(c) 7 (d) 14

489. In the given figure, diameter AB and chord CD of a circle meet at P. PT is a tangent to the circle at T. If CD = 8 cm, PD = 10 cm and PB = 8 cm, Find AB.



SSC CGL 21/07/2023 (Shift-01)

(a) 14.5 cm (b) 22.5 cm
(c) 12 cm (d) 8 cm

490. Consider AD is a tangent to a circle of radius 6 cm. AC is a secant meeting the circle at B and CD is a diameter. If AB is 7 cm, then the value of AC (in cm) is:

SSC CHSL 09/07/2024 (Shift-02)

(a) 9 (b) 18
(c) 20 (d) 16

491. Let C be a circle with centre O and radius 5 cm. Let PQ be a tangent to the circle and A be the point of tangency. Let B be a point on PQ such that the length of AB is 12 cm. If the line joining O and B intersects the circle at R, find the length of BR (in cm).

SSC CPO 04/10/2023 (Shift-01)

(a) 13 (b) 6
(c) 8 (d) 2

492. What is the length (in cm) of chord PQ in a circle with a radius of 7 cm, where a diameter AB and non-diameter chord PQ intersect perpendicularly at point C, and the ratio of AC to BC is 4 : 3?

SSC CPO 28/06/2024 (Shift-02)

(a) $4\sqrt{3}$ (b) $8\sqrt{3}$
(c) $2\sqrt{3}$ (d) $6\sqrt{3}$

493. Chords AB and CD of a circle, when produced, meet at a point P outside the circle. If AB = 6 cm, CD = 3 cm and PD = 5 cm, then PB is equal to:

SSC CHSL 10/07/2024 (Shift-03)

(a) 9 cm (b) 8 cm
(c) 4 cm (d) 6 cm

494. XAB and XCD are two secants to a circle. If XA = 18 cm, AB = 22 cm and XC = 24 cm, then find the value of XD (in cm).

SSC CGL 23/09/2024 (Shift-02)

(a) 28 (b) 21
(c) 30 (d) 34

495. A secant PAB is drawn from an external point P to the circle with the centre at O, intersecting it at A and B. If OP = 17 cm, PA = 12 cm and PB = 22.5 cm, then the radius of the circle is:

SSC CGL 26/09/2024 (Shift-03)

(a) $\sqrt{23}$ cm (b) $\sqrt{21}$ cm
(c) $\sqrt{17}$ (d) $\sqrt{19}$ cm

496. Chords AB and CD of a circle, when produced, meet at the point P. If AB = 6.3 cm, BP= 4.5 cm, and CD = 3.6 cm, then the length (in cm) of PD is

SSC CGL 13/04/2022 (Shift-01)

(a) 4.8 cm (b) 3.5 cm
(c) 3.1 cm (d) 5.4 cm

497. R is a point outside a circle and is 18 cm away from its centre. A secant drawn from the point R intersects the circle at points A and B in such a way that RA = 7 cm and AB = 5 cm. The radius of the circle (in cm) is:

SSC CGL 19/09/2024 (Shift-01)

(a) $4\sqrt{15}$ (b) $5\sqrt{15}$
(c) $7\sqrt{15}$ (d) $3\sqrt{15}$

498. In a circle, two chords AB and CD intersect each other internally at point P. If AB = 16 cm, PB = 6 cm and PD = 12 cm, then the value of PC (in cm) is equal to:

SSC CHSL 09/08/2023 (Shift-03)

(a) 3 (b) 8
(c) 6 (d) 5

499. In a circle, chords AB and CD intersect internally at E. If CD = 18 cm, DE = 5cm, AE = 13 cm, then the length of BE is:

SSC CPO 05/10/2023 (Shift-01)

(a) 5 cm (b) 4 cm
(c) 3 cm (d) 7 cm

500. In a circle, the chords AB and CD intersect each other at point L (internally). If AL = 9 cm, LB = 7 cm and LD = 3cm, then find CL (in cm).

SSC CHSL 09/07/2024 (Shift-01)

(a) 20 (b) 18
(c) 21 (d) 19

501. O is the centre of the circle. Its two chord AB and CD intersect each other at the point P (internally) within the circle. If AB = 22 cm, PB = 14 cm, CP = 8 cm, then find the value of the PD

SSC CHSL 11/07/2024 (Shift-02)

(a) 14 cm (b) 12 cm
(c) 11 cm (d) 22 cm

502. In a circle, two chords MN and PQ intersect at O. If MO = 9 cm, ON = 5 cm and OQ = 6 cm, then the value of OP (in cm) is:

SSC CGL 11/09/2024 (Shift-01)

(a) 7.5 (b) 6.5
(c) 6 (d) 7

503. Chords $\overline{AB}$ and $\overline{CD}$ of a circle intersect inside the circle at point F. If $(\overline{AF}) = 2.4$ cm, $m(\overline{BF}) = 1.8$ cm, and $m(\overline{CD}) = 5.7$ cm. What is the length (in cm) of the longer of the two line segments, $(\overline{CF})$ and $(\overline{DF})$?

SSC CHSL 09/08/2023 (Shift-01)

(a) 4.5 (b) 4.8

(c) 5.4 (d) 3.6

504. The diameter PQ of a circle with centre O is perpendicular to the chord RS. PQ intersects RS at T. If RS = 16 cm and QT = 4 cm, what is the length (in cm) of the diameter of the circle?

SSC CHSL 07/08/2023 (Shift-04)

(a) 20 (b) 48

(c) 24 (d) 10

505. JKLM is a cyclic quadrilateral in which ∠K is opposite to ∠M. When JK and ML are produced, meet at point Z. JK = 10 cm, KZ = 12 cm and MZ = 33 cm. What is the length of LZ ?

SSC CHSL 14/03/2023 (Shift-02)

(a) 9 cm (b) 8 cm

(c) 10 cm (d) 12 cm

506. A sector of a circle has a central angle of 45° and an arc length of 22 cm. Find the radius of the circle. (Use $\pi = 22/7$)

SSC CPO 03/10/2023 (Shift-02)

(a) 28 cm (b) 35 cm

(c) 36 cm (d) 32 cm

507. In a circle of radius 14 cm, an arc subtends an angle of 90° at the centre. The length of arc (in cm) is equal to: (Take $\pi = 22/7$)

SSC CHSL 02/08/2023 (Shift-03)

(a) 22 (b) 18

(c) 20 (d) 24

508. In a circle, an arc subtends an angle of 84° at the centre. If the length of the arc is 22 cm, then the radius of the circle (in cm) is equal to :
(Take $\pi = 22/7$)

SSC CHSL 10/08/2023 (Shift-02)

(a) 19 (b) 15

(c) 17 (d) 13

509. From a circle of radius 7 units, an arc length is cut by a chord of length 7 units. What is the arc length of the smaller portion (in units)?

SSC CGL 13/09/2024 (Shift-01)

(a) $\frac{8}{3}\pi$ (b) $\frac{7}{6}\pi$

(c) $\frac{7}{3}\pi$ (d) $\frac{7}{4}\pi$

510. At what angle is the arc length half the perimeter of the circle?

SSC CGL 17/09/2024 (Shift-01)

(a) 120° (b) 180°

(c) 90° (d) 270°

511. Find the number of common tangents, if $r_1 + r_2 = C_1C_2$.(With usual notations, r_1 & r_2 and C_1 & C_2 are the radii and centres of the two circles.)

SSC CGL 05/12/2022 (Shift-01)

(a) 1 (b) 0

(c) 3 (d) 4

512. If two circles do not touch or intersect each other and one does not lie inside the other, then find the number of common tangents.

SSC CGL 08/12/2022 (Shift-02)

(a) 5 (b) 4

(c) 2 (d) 3

513. Two circles with centres P and Q of radii 6 cm and 4 cm, respectively, touch each other internally. If the perpendicular bisector of PQ meets the bigger circle at A and B, then the value of AB is:

SSC CPO 05/10/2023 (Shift-02)

(a) $\sqrt{35}$ cm (b) $\sqrt{5}$ cm

(c) $2\sqrt{5}$ cm (d) $2\sqrt{35}$ cm

514. A line cuts two concentric circles. The length of chords formed by this line on the circles is 6 cm and 18 cm. Find the difference in the squares of the radii of two circles.

SSC CGL 24/09/2024 (Shift-03)

(a) 90 (b) 120

(c) 60 (d) 72

515. Two circles of diameters 16 cm and 20 cm are such that the distance between their centers is 13 cm. What is the length (in cm) of a common tangent to these circles that does not intersect the line joining the centers?

SSC CHSL 02/07/2024 (Shift-03)

(a) $\sqrt{165}$ (b) $\sqrt{173}$

(c) $\sqrt{167}$ (d) $\sqrt{163}$

516. Two circles of radii 3 units and r units, respectively, have a 6 units distance between their centers. If the length of the direct common tangent is $\sqrt{35}$ units, then the value of r is ______ units.

SSC CHSL 11/07/2024 (Shift-03)

(a) 6 (b) 4

(c) 5 (d) 3

517. The length (in cm) of a direct common tangent to two circles of radii 14 cm and 5 cm whose centres are separated by a distance of 40 cm is:

SSC CHSL 10/07/2024 (Shift-02)

(a) 40 cm (b) 41 cm

(c) $\sqrt{1539}$ cm (d) $\sqrt{1519}$ cm

518. The length of a common external tangent to two circles of an equal radius of 5 units is equal to the diameter of the circle. Which of the following can be the distance between the centres of the circles in units?

SSC CHSL 08/07/2024 (Shift-02)

(a) 10 (b) 12

(c) 9 (d) 8

519. The centres of two circles are 84 cm apart, If the radii of these two circles are 38 cm and 26 cm, respectively, then which of the following options gives the length (in cm) of a direct common tangent of these two circles?

SSC CHSL 08/07/2024 (Shift-03)

(a) $36\sqrt{3}$ (b) $48\sqrt{3}$

(c) $42\sqrt{3}$ (d) $54\sqrt{3}$

520. The distance between the centres of two circles is 81 cm, and their radius are 42 cm and 51 cm. What is the length (in cm) of the direct common tangent to the circles?

SSC CHSL 08/07/2024 (Shift-05)

(a) $51\sqrt{6}$ (b) $36\sqrt{5}$

(c) $31\sqrt{3}$ (d) $40\sqrt{2}$

521. A and B are centres of two circles of radii 32 cm and 8 cm, respectively. CD is a direct common tangent to the circles. If the length of AB = 30 cm, then the length of CD will be:

SSC CHSL 03/07/2024 (Shift-01)

(a) 10 cm (b) 20 cm

(c) 9 cm (d) 18 cm

522. In two circles centred at O and O', the distance between the centres of both circles is 17 cm. The points of contact of a direct common tangent between the circles are P and Q. If the radii of both circles are 7 cm and 15 cm, respectively, then the length of PQ is equal to:

SSC CPO 03/10/2023 (Shift-03)

(a) 15 cm (b) 22 cm

(c) 10 cm (d) 17 cm

523. A direct common tangent is drawn to two circles of radius 25 cm and 20 cm. The centres of the two circles are 35 cm apart. What is the length (in cm) of the tangent?

SSC CHSL 02/08/2023 (Shift-02)

(a) $25\sqrt{2}$ (b) $25\sqrt{3}$

(c) $20\sqrt{3}$ (d) $20\sqrt{2}$

524. The distance between the centres of two circles having radii of 24 cm and 18 cm, respectively, is 48 cm. find the length (in cm) of a direct common tangent to the two circles.

SSC CHSL 03/08/2023 (Shift-04)

(a) $20\sqrt{6}$ (b) $18\sqrt{7}$

(c) 45 (d) $22\sqrt{5}$

525. M and N are, respectively, the centres of two circles of radii 12 cm and 8 cm. QR is the common tangent to the circles. If MN = 16 cm, then what will be the length of QR?

SSC CGL 17/09/2024 (Shift-02)

(a) $5\sqrt{17}$ cm (b) $4\sqrt{15}$ cm

(c) $3\sqrt{19}$ cm (d) $6\sqrt{8}$ cm

526. For two circles of radius 7 units and $\frac{7}{2}$ units, whose centres are 15 units apart, what is the length of the direct common tangent in units? (Correct to 3 decimal places.)

SSC CGL 23/09/2024 (Shift-01)

(a) 14.586 (b) 18.654
(c) 15.486 (d) 16.584

527. R wishes to use a stick of length 6 units as common internal tangent to two circles of radius two units and three units. What can be the maximum distance (in units) between the centres of the circle?

SSC CHSL 10/07/2024 (Shift-01)

(a) $\sqrt{67}$ (b) $\sqrt{61}$
(c) $\sqrt{33}$ (d) $\sqrt{37}$

528. R wishes to use a stick of length 6 units as common internal tangent to two circles of radius two units and three units. What can be the maximum distance (in units) between the centres of the circle?

SSC CHSL 10/07/2024 (Shift-01)

(a) $\sqrt{67}$ (b) $\sqrt{61}$
(c) $\sqrt{33}$ (d) $\sqrt{37}$

529. R wishes to use a stick of length 6 units as common internal tangent to two circles of radius two units and three units. What can be the maximum distance (in units) between the centres of the circle?

SSC CHSL 10/07/2024 (Shift-01)

(a) $\sqrt{67}$ (b) $\sqrt{61}$
(c) $\sqrt{33}$ (d) $\sqrt{37}$

530. The radii of two circle are 5 cm and 10 cm and the distance between their centres is 17 cm. Find the length of the transverse common tangent.

SSC CGL 10/09/2024 (Shift-03)

(a) 9 cm (b) 8 cm
(c) 6 cm (d) 7.5 cm

531. The distance between the centres of two circles of radii 7 cm and 5 cm is 15 cm. Find the length of the transverse common tangent to these circles.

SSC CHSL 05/07/2024 (Shift-01)

(a) 7 cm (b) 13 cm
(c) 11 cm (d) 9 cm

532. The radii of the two circles are 7 cm and 4 cm. If the distance between their centres is 25 cm, then the length of the transverse common tangent is equal to:

SSC CHSL 10/07/2024 (Shift-01)

(a) $6\sqrt{12}$ cm (b) $6\sqrt{11}$ cm
(c) $6\sqrt{14}$ cm (d) $6\sqrt{13}$ cm

533. If the radii of two circles are 6 cm and 3 cm and the length of the transverse common tangent is 8 cm, then the distance between the two circles is:

SSC CHSL 01/07/2024 (Shift-03)

(a) $\sqrt{145}$ (b) $\sqrt{141}$
(c) $\sqrt{147}$ (d) $\sqrt{143}$

534. The distance between the centres of two circle of radii 4 cm, and 2 cm is 10 cm. The length (in cm) of a transverse common tangent is:

SSC CHSL 03/07/2024 (Shift-02)

(a) 13 (b) 11
(c) 6 (d) 8

535. The distance between the centres of the two circles, with radii 3 cm and 2 cm, respectively, is 13 cm. The length (in cm) of a transverse common tangent is:

SSC CPO 29/06/2024 (Shift-01)

(a) 18 cm (b) 12 cm
(c) 9 cm (d) 16 cm

536. What is the length (in cm) of the transverse common tangent between two circles with radii 6 cm and 4 cm, given that the distance between their centres is 14 cm?

SSC CPO 03/10/2023 (Shift-02)

(a) $2\sqrt{6}$ (b) $3\sqrt{6}$
(c) $4\sqrt{6}$ (d) $5\sqrt{6}$

537. If the radius of two circles be 6 cm and 9 cm and the length of the transverse common tangent be 20 cm, then find the distance between the two centres.

SSC CPO 05/10/2023 (Shift-01)

(a) 27 cm (b) 22 cm
(c) 24 cm (d) 25 cm

538. If the distance between the centres of two circles is 12cm and the radii are 5 cm and 4 cm, then the length (in cm) of the transverse common tangent is:

SSC CHSL 02/08/2023 (Shift-02)

(a) 9 (b) $\sqrt{143}$
(c) $\sqrt{63}$ (d) 7

539. If the sum of the radii and the distance between the centers of two circles are equal, then:

SSC CHSL TIER-II 26/06/2023

(a) The circles touch externally
(b) The circles intersect each other.
(c) Circles are concentric.
(d) The circles touch internally.

540. Two circles touch each other at a point O. AB is a simple common tangent to both the circles touching at point A and point B. If radii of the circles are 9 am and 4 cm, then find AB.

SSC CHSL 01/07/2024 (Shift-02)

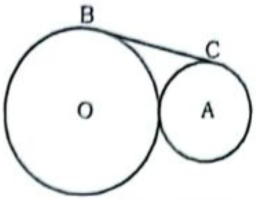
(a) 72 cm (b) 144 cm
(c) 12 cm (d) 24 cm

541. Two circles of radii 16 cm and 4 cm, respectively, touch each other externally at Point A. PQ is the direct common tangent of these circles with centres C_1 and C_2, respectively. What is the length of PQ?

SSC CHSL 08/07/2024 (Shift-01)

(a) 15 cm (b) 20 cm
(c) 16 cm (d) 18 cm

542. Two circles touch each other externally as shown in the figure above. The radius of the circle with centre O is 49 cm. The radius of the circle with centre A is 16 cm. Find the length (in cm) of their common tangent BC.



SSC CHSL 02/07/2024 (Shift-01)

(a) 56 (b) 55
(c) 58 (d) 57

543. Two circles touch each other externally. The radius of the first circle with centre A is 18 cm. The radius of the second circle with centre B is 8 cm. Find the length of their common tangent CD.

SSC CPO 11/11/2022 (Shift-01)

(a) 23 cm (b) 26 cm
(c) 24 cm (d) 25 cm

544. In the following figure, there are two circles that touch each other externally. The radius of the first circle with centre P is 25 cm. The radius of the second circle with centre Q is 4 cm. Find the length of their direct common tangent AB.

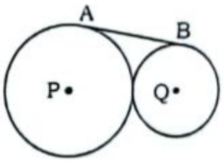


Figure is not to scale and is only for representational purpose

SSC CGL 25/07/2023 (Shift-01)

(a) 21 cm (b) 18 cm
(c) 20 cm (d) 22 cm

545. There are two circles touching each other externally. The radius of the first circle with centre O is 12 cm. The radius of the second circle with centre A is 5 cm. Find the length of their common tangent touching the two circles at points P and Q.

SSC CHSL 11/07/2024 (Shift-03)

(a) $4\sqrt{15}$ cm (b) $14\sqrt{5}$ cm
(c) $5\sqrt{41}$ cm (d) $5\sqrt{14}$ cm

546. Two circles with centre O and A touch each other externally. The radius of the first circle with centre O is 6 cm. The radius of the second circle with centre A is 3 cm. Find the length of their common tangent CB (in centimetres.

SSC CHSL 03/07/2024 (Shift-04)

(a) $3\sqrt{2}$ (b) $4\sqrt{3}$
(c) $4\sqrt{2}$ (d) $6\sqrt{2}$

547. Two circles of radii 18 cm and 12 cm touch each other externally. Find the length (in cm) of their direct common tangent.

SSC CGL 10/09/2024 (Shift-01)

(a) $15\sqrt{6}$ (b) $10\sqrt{6}$
(c) $12\sqrt{6}$ (d) $18\sqrt{6}$

548. If two circles of radii 35 cm and 25 cm touch each other externally, then the length (in cm) of a common tangent is (Rounded off to 2 decimal places)

SSC CPO 27/06/2024 (Shift-03)

(a) 45.29 (b) 52.25
(c) 59.16 (d) 60.00

549. Two circles C_1 and C_2 touch each other externally. The radius of C_1 = 16 cm and the radius of C_2 = 8 cm. Find the length (in cm) of their common tangent.

SSC CGL 12/09/2024 (Shift-01)

(a) $8\sqrt{3}$ (b) $16\sqrt{3}$
(c) $8\sqrt{2}$ (d) $16\sqrt{2}$

550. A bigger circle centre at O and a smaller circle centre at P touch each other externally such that the length of their common tangent LM is 12 cm. If the radius of the bigger circle is 18 cm, then what will be the radius (in cm) of the smaller circle?

SSC CHSL 09/07/2024 (Shift-01)

(a) 4 (b) 3
(c) 2 (d) 1

551. The length of the common tangent PQ for two circles touching externally is 16 cm. If the radius (OP) of the bigger circle is 20 cm, then the radius (RQ) of the smaller circle is:

SSC CHSL 08/08/2023 (Shift-03)

(a) 3.2 cm (b) 3.6 cm
(c) 3.5 cm (d) 3.8 cm

552. Two circles with centres M and N have radii 5 cm and 8 cm, respectively. The circles touch each other externally at point T. A line PR is drawn such that the points M, T and N lie on PR, P being closer to M. From P, a tangent PQ = 12 cm is drawn to the circle with centre M touching at Q, and from R, another tangent RS = 15 cm is drawn to the circle with centre N touching at S. What is the length (in cm) of PR?

SSC CHSL 04/07/2024 (Shift-03)

(a) 37 (b) 43
(c) 53 (d) 26

553. P and Q are centres of two circles whose radii are 7 cm and 3 cm, respectively. If the direct common tangents to the circles meet PQ extended at A, then A divides PQ _____.

SSC CGL 11/09/2024 (Shift-03)

(a) externally in the ratio 3 : 7
(b) internally in the ratio 3 : 7
(c) externally in the ratio 7 : 3
(d) internally in the ratio 7 : 3

554. The centres of two circles of radii 20 cm and 32 cm are 60 cm apart. What is the ratio of the length of the direct common tangent to the length of the transverse common tangent to these circles?

SSC CHSL 10/07/2024 (Shift-03)

(a) $3\sqrt{3}:\sqrt{7}$ (b) $3\sqrt{2}:\sqrt{7}$
(c) $3\sqrt{7}:\sqrt{3}$ (d) $7\sqrt{3}:3$

555. The centers of two circles of radii 25 cm and 35 cm are 80 cm apart. What is the ratio of the lengths of the transverse common tangent to the direct common tangent to these circles?

SSC CHSL 04/07/2024 (Shift-02)

(a) 2 : 3 (b) $\sqrt{7}$: 3
(c) $3\sqrt{7}$: 2 (d) 2 : $\sqrt{7}$

556. The centres of two circles are 36 cm apart. If the radii of these two circles are 15 cm and 9 cm, respectively, then what is the sum of the lengths (in cm) of a direct common tangent and a transverse common tangent of these two circles?

SSC CGL 25/09/2024 (Shift-01)

(a) $6\sqrt{5}(\sqrt{7}+2)$ (b) $6\sqrt{7}(\sqrt{5}+2)$
(c) $6\sqrt{5}(\sqrt{5}+2)$ (d) $6\sqrt{7}(\sqrt{7}+2)$

557. If the length of a common external tangent to two circles is 9 and that of a common internal tangent is 5, then the product of the radii of the two circles is:

SSC CGL 10/09/2024 (Shift-03)

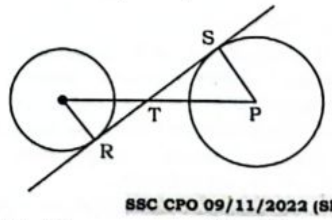
(a) 12 (b) 8
(c) 14 (d) 10

558. Two circles with centers B and D have radii DA = 8 cm and BC = x cm, respectively. AC is tangent to both circles. If DB and AC intersect the point E, AE = 12 cm and EC = 18 cm, then find the value of x (in cm).

SSC CPO 27/06/2024 (Shift-02)

(a) 13 (b) 10
(c) 11 (d) 12

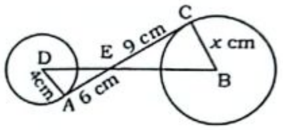
559. In the given figure, the circle with centre O has radius 10 cm. The radius of the circle with centre P is x cm. STR is a common tangent to the two circles at points R and S as shown in the figures. RT = 16 cm and TS = 24 cm. What is the value of x (in cm)?



SSC CPO 09/11/2022 (Shift-03)

(a) 15 (b) 16
(c) 12 (d) 18

560. In the following figure, the circles with centres B and D have radius 4 cm and x cm, respectively. AC is a tangent to both the circles. Find the value of x.



SSC CGL 25/07/2023 (Shift-04)

(a) 6 (b) 3
(c) 7 (d) 5

561. Two circles touch each other externally at T. RS is a direct common tangent to the two circles touching the circles at P and Q. ∠TPQ = 42°, ∠PQT (in degrees) is:

SSC CGL 11/04/2022 (Shift-03)

(a) 48 (b) 45
(c) 42 (d) 60

562. Two circles touch each other externally at C. AB is a direct common tangent to the two circles. A and B are points of contact and ∠CAB = 55°. Then ∠ACB is:

SSC CPO 05/10/2023 (Shift-02)

(a) 90° (b) 55°
(c) 35° (d) 45°

563. Two circles touch each other externally at M. PQ is a direct common tangent to the two circles, P and Q are points of contact and ∠MPQ = 38°, ∠MQP is:

SSC CHSL 03/07/2024 (Shift-02)

(a) 48° (b) 52°
(c) 38° (d) 42°

564. Two circles intersect each other such that each passes through the centre of each other. Radius of these circles are equal. If the Length of common chord is $14\sqrt{3}$ cm then what will be the sum of circumferences of these two circles?

SSC CHSL 10/03/2023 (Shift-01)

(a) 88 cm (b) 352 cm
(c) 176 cm (d) 188 cm

565. The length of the common chord of two intersecting circles is 24 cm. If the diameter of the circles are 30 cm and 26 cm, then the distance between the centres (in cm) is:

SSC CPO 05/10/2023 (Shift-03)

(a) 18 cm (b) 16 cm
(c) 12 cm (d) 14 cm

566. Two equal circles pass through each other's centre. If the radius of each of the circle is 13 cm, then what is the length of the common chord?

SSC CGL 18/09/2024 (Shift-03)

(a) $13\sqrt{6}$ cm
(b) $7\sqrt{3}$ cm
(c) $13\sqrt{2}$ cm
(d) $13\sqrt{3}$ cm

567. PQ and RS are common tangents to two circles intersecting at A and B. A and B, when produced on both the sides, meet the tangents PQ and RS at X and Y, respectively. If AB = 3 cm and XY = 5 cm, then PQ is _______.

SSC CGL 19/09/2024 (Shift-02)

(a) 5 cm (b) 3 cm
(c) 6 cm (d) 4 cm

568. Two circles of radius 13 cm and 15 cm intersect each other at points A and B. If the length of the common chord is 12 cm, then what is the distance between their centres?

SSC CPO 03/10/2023 (Shift-01)

(a) $\sqrt{145}+\sqrt{184}$ (b) $\sqrt{131}+\sqrt{181}$
(c) $\sqrt{145}+\sqrt{169}$ (d) $\sqrt{133}+\sqrt{189}$

569. Two circles with diameters 50 cm and 58 cm, respectively, intersect each other at points A and B, such that the length of the common chord is 40 cm. Find the distance (in cm) between the centres of these two circles.

SSC CHSL 08/08/2023 (Shift-03)

(a) 34 (b) 37
(c) 36 (d) 35

570. Two circles of same radius 6 cm, intersect each other at P and Q. If PQ = 10 cm then what is the distance between the centres of the two circles?

SSC CGL 19/07/2023 (Shift-01)

(a) 10 cm (b) 8 cm
(c) $6\sqrt{11}$ cm (d) $2\sqrt{11}$ cm

571. Two circles having equal radius intersect each other such that each passes through the centre of the other. Length of the common chord is 24 cm, then what will be the diameter of each circle?

SSC CHSL 15/03/2023 (Shift-04)

(a) $16\sqrt{3}$ cm (b) $8\sqrt{3}$ cm
(c) $12\sqrt{3}$ cm (d) $10\sqrt{3}$ cm

572. Two circles having equal radius intersect each other such that each passes through the center of the other. Sum of diameter of these two circles is 84 cm. what is the length of the common chord?

SSC CHSL 17/03/2023 (Shift-04)

(a) $21\sqrt{3}$ cm (b) $14\sqrt{3}$ cm
(c) $28\sqrt{3}$ cm (d) $24\sqrt{3}$ cm

573. Two circles have radii of 27 cm and 36 cm. The distance between their centres is 45 cm. What is the length (in cm) of their common chord?

SSC CHSL 08/07/2024 (Shift-02)

(a) 37.2 cm (b) 40.5 cm
(c) 43.2 cm (d) 47.5 cm

574. ABCD is a cyclic quadrilateral in which ∠B is opposite to ∠D. If ∠B = x + 10° and ∠D = $2x$ + 35°, then what is the value of x?

SSC CHSL 17/03/2023 (Shift-03)

(a) 35° (b) 40°
(c) 50° (d) 45°

575. PQRS is a cyclic quadrilateral. If ∠P is three times of ∠R and ∠S is four times of ∠Q, then the sum of ∠S + ∠R will be:

SSC CGL TIER-II 07/03/2023

(a) 169° (b) 171°
(c) 187° (d) 189°

576. ABCD is a cyclic quadrilateral. AC and BD intersect each other at P. If AB = AC and ∠BAC = 48°, then the measure of ∠ADC is:

SSC CGL 12/04/2022 (Shift-03)

(a) 104° (b) 112°
(c) 132° (d) 114°

577. ABCD is a cyclic quadrilateral. Diagonals BD and AC intersect each other at E. If ∠BEC = 138° and ∠ECD = 35°, then what is the measure of ∠BAC?

SSC CGL 13/08/2021 (Shift-02)

(a) 133° (b) 103°
(c) 113° (d) 123°

578. ΔABC is inscribed in a circle with center O, such that ∠ACB = 115°. O is joined to A. What is the measure of ∠OAB?

SSC CGL 16/08/2021 (Shift-03)

(a) 30° (b) 20°
(c) 25° (d) 35°

579. ABCD is a cyclic quadrilateral. Sides AB and DC, when produced, meet at E and sides AD and BC when produced, meet at F. If ∠ADC = 76° and ∠AED = 55°, then ∠AFB is equal to:

SSC CGL Tier II 03/02/2022

(a) 34° (b) 26°
(c) 29° (d) 27°

580. Side AB and DC of a cyclic quadrilateral ABCD are produced to meet at E and sides AD and BC are produced to meet at F. If ∠ADC = 78° and ∠BEC = 52°, then the measure of ∠AFB is:

SSC CGL 13/08/2021 (Shift-01)

(a) 26° (b) 32°
(c) 30° (d) 28°

581. AB is a chord of a circle with centre O, C is a point on the circumference of the circle in the minor sector. If ∠ABO = 40°, what is the measure (in degree) of ∠ACB?

SSC CGL 19/04/2022 (Shift-03)

(a) 110° (b) 120°
(c) 130° (d) 110°

582. In a circle, ABCD is a cyclic quadrilateral in which AE is drawn parallel to CD, and BA is produced to F. If ∠ABC = 85° and ∠FAE = 24°, find the value of ∠BCD.

SSC CHSL 01/07/2024 (Shift-02)

(a) 125° (b) 115°
(c) 124° (d) 119°

583. An equilateral triangle ABC is inscribed in a circle with centre O. D is a point on the minor arc BC and ∠CBD = 40°. Find the measure of ∠BCD.

SSC CGL 11/04/2022 (Shift-01)

(a) 30° (b) 50°
(c) 20° (d) 40°

584. ABCD is a cyclic quadrilateral such that AB is a diameter of the circle and ∠ADC = 118°. What is the measure of ∠BAC ?

SSC CPO 24/11/2020 (Shift-01)

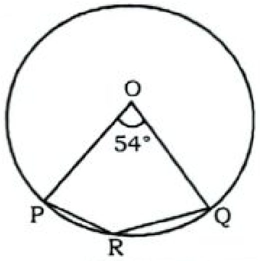
(a) 32° (b) 28°
(c) 45° (d) 30°

585. A cyclic quadrilateral ABCD is drawn in a circle with centre O. A and C are joined to O. If ∠ABC = 2p and ∠ADC = 3p, what is the measure (in degrees) of the ∠AOC reflex?

SSC CGL 12/04/2022 (Shift-02)

(a) 200 (b) 245
(c) 210 (d) 216

586. In the given figure, O is the centre of the circle. ∠POQ = 54°. What is the measure (in degree) of ∠PRQ?



SSC CGL 13/04/2022 (Shift-02)

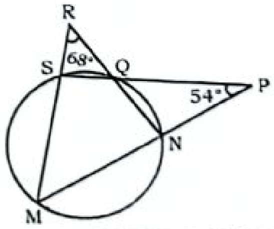
(a) 137° (b) 235°
(c) 207° (d) 153°

587. PQRS is a cyclic quadrilateral in which PQ = 14.4 cm, QR = 12.8 cm and SR = 9.6 cm. If PR bisects QS, what is the length of PS?

SSC CGL TIER-II 11/09/2019

(a) 15.8 cm (b) 13.8 cm
(c) 16.4 cm (d) 19.2 cm

588. In the given figure, MNP, SQP, NQR and MSR are straight lines. ∠NPQ = 54° and ∠QRS = 68°, what is the degree measure of ∠SMN?



SSC CPO 10/11/2022 (Shift-03)

(a) 29° (b) 38°
(c) 54° (d) 68°

• TYPE – VII •
MISCELLANEOUS QUESTION

589. The angle turned by minutes hand in 25 minutes in a clock is:

SSC CGL 13/09/2024 (Shift-03)

(a) π (b) $\frac{\pi}{2}$
(c) $\frac{5\pi}{3}$ (d) $\frac{5\pi}{6}$

590. By decreasing 17° from each angle of a triangle, the ratio of their angles is 3 : 4 : 7. The radian measure of the greatest angle is:

SSC CHSL 09/07/2024 (Shift-04)

(a) $\frac{153\pi}{360}$ (b) $\frac{167\pi}{180}$

(c) $\frac{163\pi}{360}$ (d) $\frac{163\pi}{180}$

591. In right triangle ABC with right angle at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D, such that DM = CM. Point D is joined to B. If CD = 10 cm, and BD = 6cm, find the value of CM.

SSC CHSL 04/07/2024 (Shift-02)

(a) 8 cm (b) 5 cm

(c) 9.5 cm (d) 11.4 cm

592. The median AD of a ΔABC is produced and a perpendicular CF is dropped on it. BE is perpendicular to AD. If BC = 34 cm and DF = 8 cm, what is the length (in cm) of BE?

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 17 (b) 15

(c) 19 (d) 9

593. In a square ABCD, diagonals AC and BD intersect at O. The angle bisector of ∠CAB meets BD and BC at F and G, respectively. OF:CG is equal to:

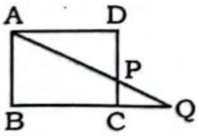
SSC CGL TIER-II 03/02/2022

(a) 1 : 2 (b) 1 : 3

(c) 1 : $\sqrt{2}$ (d) 1 : $\sqrt{3}$

594. In the given figure ABCD is a rectangle and P is a point on DC such that BC is 24 cm, DP = 10 cm, and CD is 15 cm. If the produced line AP intersects the produced line BC at point Q, then find the length of AQ.

SSC CGL Tier II 18/11/2020



(a) 39 cm (b) 35 cm

(c) 26 cm (d) 24 cm

595. The side MN of a parallelogram MNOP is produced to Q such that MN = NQ. PQ intersects ON at R. The point R divides ON in the ratio:

SSC CGL 18/09/2024 (Shift-03)

(a) 3 : 1 (b) 2 : 1

(c) 1 : 2 (d) 1 : 1

596. M is the mid-point of side QR of a parallelogram PQRS (P being on the top left hand, followed by other point going clockwise). The line SM is drawn intersecting PQ produced at T. What is the length (in term of the length of SR) of PT?

SSC CHSL 10/08/2023 (Shift-01)

(a) $\frac{3SR}{2}$ (b) $\frac{SR}{2}$

(c) 2SR (d) SR

597. In a kite ABCD, longer diagonal BD is drawn. If ∠ABD = 54° and ∠ADB = 50°, then what is the measure (in degrees) of the ∠DCB?

SSC CGL 19/09/2024 (Shift-03)

(a) 108° (b) 76°

(c) 100° (d) 54°

598. AB is the chord of a circle such that AB = 10 cm. If the diameter of the circle is 20 cm, then the angle subtended by the chord at the centre is ______.

SSC CGL TIER-II 08/08/2022

(a) 45° (b) 90°

(c) 60° (d) 30°

599. A triangle ABC is made on a circle, where AB is diameter of the circle. If BC is equal to the radius of the circle and ∠ABC = x ∠BAC, then x is:

SSC CGL 23/09/2024 (Shift-01)

(a) 2.5 (b) 2

(c) 1 (d) 1.5

600. In a circle with center O, an arc ABC subtends an angle of 138° at the centre of the circle. The chord AB is produced to a point P. Then, the measure of ∠CBP is:

SSC CGL 26/09/2024 (Shift-02)

(a) 108° (b) 42°

(c) 111° (d) 69°

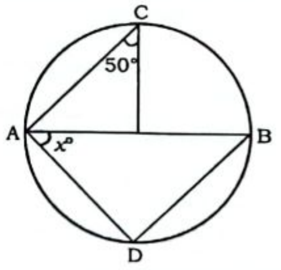
601. Let C be a circle with center O and PQ be the diameter of C. Let AB be a chord on C. If ∠QOB = 40°, ∠AOP = 80° then find ∠AOB.

SSC CHSL 11/07/2024 (Shift-03)

(a) 100° (b) 60°

(c) 90° (d) 70°

602. In the given circle with diameter AB, find the value of x.

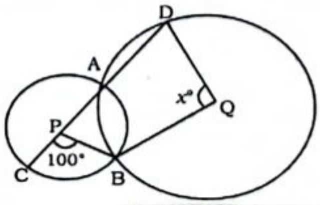


SSC CPO 10/11/2022 (Shift-02)

(a) 40° (b) 20°

(c) 30° (d) 50°

603. In the following figure, P and Q are centres of two circles. The circles are intersecting at points A and B. PA produced on both the sides meets the circles at C and D. If ∠CPB = 100°, then find the value of x.



SSC CGL 18/04/2022 (Shift-01)

(a) 110° (b) 100°

(c) 120° (d) 115°

604. AC is the diameter of a circle dividing the circle into two semicircles. ED is a chord in one semicircle, such that ED is parallel to AC. B is a point on the circumference of the circle in the other semicircle. ∠CBE = 75°. What is the measure (in degrees) of ∠CED?

SSC CGL 20/04/2022 (Shift-02)

(a) 37° (b) 68°

(c) 15° (d) 75°

605. Points P, Q, R, S and T lie in this order on a circle with centre O. If chord TS is parallel to diameter PR and ∠RQT = 58°, then find the measure (in degrees) of ∠RTS.

SSC CGL 17/08/2021 (Shift-02)

(a) 58 (b) 29

(c) 45 (d) 32

606. Points A, B and C are on a circle with centre O such that ∠BOC = 84°. If AC is produced to a point D such that ∠BDC = 40° Then find the measure of ∠ABD (in degrees).

SSC CGL 24/08/2021 (Shift-02)

(a) 91 (b) 92

(c) 56 (d) 98

607. ΔPQR is inscribed in a circle. The bisector of ∠P cuts QR at S and the circle at T. If PR = 5cm, PS = 6cm and ST = 4cm, then the length (in cm) of PQ is:

SSC CHSL 19/04/2021 (Shift-01)

(a) 13 (b) 12

(c) 10 (d) 15

608. Let O be the centre of a circle and AC be the diameter. BD is a chord intersecting AC at E. AD and AB are joined. If ∠BOC = 40° and ∠AOD = 120°, then ∠BEC is equal to:

SSC CHSL 10/08/2021 (Shift-01)

(a) 90° (b) 70°

(c) 80° (d) 55°

609. In a circle with centre O, AD is a diameter and AC is chord. Point B is on AC such that OB = 7 cm and ∠OBA = 60°. If ∠DOC = 60°, then what is the length of BC?

SSC CPO 25/11/2020 (Shift-02)

(a) $3\sqrt{7}$ (b) $5\sqrt{7}$

(c) 7 cm (d) 3.5 cm

610. In a circle of radius 10 cm, with centre O. PQ and PR are two chords each of length 12 cm. PO intersects chord QR at the point S. The length of OS is:

SSC CGL 04/06/2019 (Shift-01)

(a) 2.8 cm (b) 2.5 cm

(c) 3.2 cm (d) 3 cm

611. The radii of the two concentric circles are 27 cm and 18 cm. The area (in cm^2) of the closed figure bounded by the boundaries of the circle is:

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 405π (b) 504π

(c) 288π (d) 505π

612. The radii of two concentric circles are 34 cm and 50 cm. A and D are the points on larger circle and B and C are points on smaller circle. If ABCD is a straight line and BC = 32 cm, then what is the length of AD?

SSC CHSL 16/03/2023 (Shift-01)

(a) 60 cm (b) 80 cm
(c) 75 cm (d) 40 cm

613. AB is the chord of the circle with centre O. A line segment DOC originating from a point D on the circumference of the circle in major segment meets AB produced at C such that BC = OD. If ∠BCO = 30°, then ∠AOD is?

SSC CGL 23/09/2024 (Shift-02)

(a) 30° (b) 90°
(c) 60° (d) 80°

614. AB and CD are two chords in a circle with centre O and AD is the diameter. When produced, AB and CD meet at the point P. If ∠DAP = 27°, ∠APD = 35°, then what is the measure (in degrees) of ∠DBC?

SSC CGL 21/04/2022 (Shift-02)

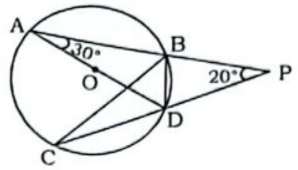
(a) 32 (b) 30
(c) 28 (d) 26

615. AB is a chord of length 32 cm of a circle of radius 20 cm, the tangents at A and B intersect at a point T. Find length TA (rounded off to two digits after decimal).

SSC CGL 19/09/2024 (Shift-01)

(a) 36.50 cm
(b) 21.33 cm
(c) 26.67 cm
(d) 19.93 cm

616. PBA and PDC are two secants. AD is the diameter of the circle with the centre at O. ∠A = 30°, ∠P = 20°. Find the measure of ∠DBC.



SSC CHSL 11/07/2024 (Shift-01)

(a) 50° (b) 30°
(c) 45° (d) 40°

617. CD is a tangent to a circle of circumference of 88 cm with its centre at O, OC cuts the circle at P while OD cuts circle at V such that ∠COD = 90°. Length of PC is 6 cm. What is half of CD (in cm) if OD exceeds OC by 1 cm?

SSC CHSL 01/07/2024 (Shift-03)

(a) 15.5 (b) 14.5
(c) 31 (d) 16.5

618. In a circle with center O, the diameter AB extended to the point C, outside the circle. CD is a tangent at the point D on the circle. If the radius of circle is 6 cm and ∠DBC = 120°, then the length of CD is equal to:

SSC CHSL 09/07/2024 (Shift-04)

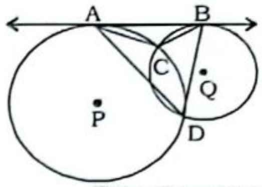
(a) $5\sqrt{3}$ cm
(b) $3\sqrt{3}$ cm
(c) $6\sqrt{3}$ cm
(d) $4\sqrt{3}$ cm

619. PQ is a diameter of a circle with centre O. The tangents at R meets PQ produced at A. If ∠RPQ = 27°, then measure of ∠RQP is.

SSC CHSL 01/07/2024 (Shift-02)

(a) 63° (b) 54°
(c) 153° (d) 27°

620. Two circles, centred at P and Q intersect at two points C and D. AB is tangent to the two circles at A and B. If ∠ADB = 68°, then ∠ACB = ______.



SSC CGL 13/09/2024 (Shift-03)

(a) 132° (b) 112°
(c) 124° (d) 102°

621. The two circles intersect at two points P and Q. PR and PS are diameters of the two circles. What is ∠PQR ?

SSC CGL 25/09/2024 (Shift-02)

(a) 90° (b) 0°
(c) 45° (d) 60°

622. A and B are centres of two circles with radii 2 cm and 1 cm respectively, where AB = 5 cm. C is the centre of another circle of radius r cm, which touches each of the above two circles externally. If ∠ACB = 90°, then the value of r is:

SSC CGL 13/09/2024 (Shift-01)

(a) 5 cm (b) 2 cm
(c) 3 cm (d) 4 cm

ANSWER KEY

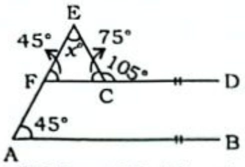
1.	(a)	2.	(d)	3.	(c)	4.	(d)	5.	(a)	6.	(b)	7.	(d)	8.	(c)	9.	(b)	10.	(a)
11.	(a)	12.	(b)	13.	(a)	14.	(d)	15.	(d)	16.	(d)	17.	(a)	18.	(a)	19.	(b)	20.	(b)
21.	(d)	22.	(c)	23.	(c)	24.	(d)	25.	(a)	26.	(b)	27.	(d)	28.	(a)	29.	(c)	30.	(b)
31.	(d)	32.	(a)	33.	(b)	34.	(c)	35.	(c)	36.	(c)	37.	(a)	38.	(c)	39.	(c)	40.	(b)
41.	(c)	42.	(a)	43.	(a)	44.	(b)	45.	(a)	46.	(b)	47.	(a)	48.	(a)	49.	(d)	50.	(a)
51.	(a)	52.	(d)	53.	(b)	54.	(c)	55.	(c)	56.	(a)	57.	(a)	58.	(b)	59.	(d)	60.	(a)
61.	(a)	62.	(c)	63.	(b)	64.	(a)	65.	(d)	66.	(a)	67.	(a)	68.	(a)	69.	(a)	70.	(b)
71.	(d)	72.	(b)	73.	(b)	74.	(b)	75.	(c)	76.	(a)	77.	(b)	78.	(b)	79.	(a)	80.	(b)
81.	(d)	82.	(d)	83.	(b)	84.	(d)	85.	(b)	86.	(a)	87.	(a)	88.	(d)	89.	(d)	90.	(d)
91.	(d)	92.	(a)	93.	(b)	94.	(b)	95.	(b)	96.	(c)	97.	(b)	98.	(a)	99.	(d)	100.	(d)
101.	(a)	102.	(b)	103.	(d)	104.	(b)	105.	(c)	106.	(a)	107.	(a)	108.	(d)	109.	(d)	110.	(c)
111.	(d)	112.	(b)	113.	(b)	114.	(c)	115.	(b)	116.	(d)	117.	(d)	118.	(b)	119.	(a)	120.	(a)
121.	(c)	122.	(d)	123.	(a)	124.	(c)	125.	(a)	126.	(d)	127.	(c)	128.	(c)	129.	(c)	130.	(b)
131.	(c)	132.	(c)	133.	(a)	134.	(c)	135.	(a)	136.	(c)	137.	(b)	138.	(c)	139.	(c)	140.	(d)
141.	(a)	142.	(c)	143.	(c)	144.	(a)	145.	(c)	146.	(c)	147.	(a)	148.	(c)	149.	(a)	150.	(c)
151.	(a)	152.	(d)	153.	(a)	154.	(b)	155.	(b)	156.	(d)	157.	(c)	158.	(c)	159.	(b)	160.	(d)
161.	(c)	162.	(d)	163.	(c)	164.	(c)	165.	(a)	166.	(b)	167.	(d)	168.	(a)	169.	(a)	170.	(c)
171.	(b)	172.	(d)	173.	(c)	174.	(c)	175.	(c)	176.	(d)	177.	(d)	178.	(d)	179.	(c)	180.	(a)
181.	(d)	182.	(b)	183.	(d)	184.	(a)	185.	(b)	186.	(d)	187.	(c)	188.	(a)	189.	(a)	190.	(d)
191.	(b)	192.	(b)	193.	(a)	194.	(b)	195.	(b)	196.	(b)	197.	(a)	198.	(c)	199.	(a)	200.	(c)

Chapter - 24 : Geometry

201.	(d)	202.	(b)	203.	(d)	204.	(d)	205.	(b)	206.	(a)	207.	(d)	208.	(c)	209.	(b)	210.	(d)
211.	(c)	212.	(a)	213.	(d)	214.	(a)	215.	(b)	216.	(b)	217.	(a)	218.	(d)	219.	(c)	220.	(d)
221.	(b)	222.	(c)	223.	(a)	224.	(b)	225.	(d)	226.	(a)	227.	(a)	228.	(d)	229.	(d)	230.	(c)
231.	(b)	232.	(d)	233.	(d)	234.	(a)	235.	(a)	236.	(d)	237.	(d)	238.	(a)	239.	(c)	240.	(d)
241.	(a)	242.	(d)	243.	(c)	244.	(b)	245.	(a)	246.	(c)	247.	(c)	248.	(b)	249.	(c)	250.	(d)
251.	(b)	252.	(d)	253.	(c)	254.	(d)	255.	(d)	256.	(c)	257.	(c)	258.	(a)	259.	(d)	260.	(b)
261.	(a)	262.	(a)	263.	(a)	264.	(d)	265.	(b)	266.	(a)	267.	(b)	268.	(a)	269.	(d)	270.	(d)
271.	(b)	272.	(a)	273.	(a)	274.	(a)	275.	(b)	276.	(b)	277.	(d)	278.	(d)	279.	(d)	280.	(c)
281.	(a)	282.	(c)	283.	(d)	284.	(d)	285.	(c)	286.	(c)	287.	(d)	288.	(b)	289.	(d)	290.	(d)
291.	(a)	292.	(d)	293.	(d)	294.	(d)	295.	(a)	296.	(a)	297.	(b)	298.	(b)	299.	(a)	300.	(c)
301.	(c)	302.	(d)	303.	(a)	304.	(b)	305.	(a)	306.	(a)	307.	(c)	308.	(c)	309.	(c)	310.	(d)
311.	(b)	312.	(d)	313.	(a)	314.	(d)	315.	(a)	316.	(c)	317.	(a)	318.	(c)	319.	(d)	320.	(b)
321.	(b)	322.	(d)	323.	(d)	324.	(d)	325.	(d)	326.	(a)	327.	(b)	328.	(d)	329.	(a)	330.	(a)
331.	(b)	332.	(c)	333.	(c)	334.	(d)	335.	(c)	336.	(d)	337.	(d)	338.	(c)	339.	(b)	340.	(b)
341.	(b)	342.	(b)	343.	(b)	344.	(c)	345.	(b)	346.	(d)	347.	(d)	348.	(c)	349.	(b)	350.	(b)
351.	(c)	352.	(d)	353.	(d)	354.	(b)	355.	(b)	356.	(a)	357.	(d)	358.	(d)	359.	(a)	360.	(b)
361.	(c)	362.	(c)	363.	(a)	364.	(b)	365.	(c)	366.	(d)	367.	(d)	368.	(c)	369.	(a)	370.	(c)
371.	(c)	372.	(a)	373.	(a)	374.	(b)	375.	(c)	376.	(d)	377.	(d)	378.	(b)	379.	(d)	380.	(b)
381.	(d)	382.	(c)	383.	(b)	384.	(a)	385.	(a)	386.	(b)	387.	(c)	388.	(a)	389.	(a)	390.	(c)
391.	(d)	392.	(a)	393.	(c)	394.	(d)	395.	(c)	396.	(a)	397.	(a)	398.	(d)	399.	(a)	400.	(d)
401.	(c)	402.	(d)	403.	(b)	404.	(c)	405.	(b)	406.	(c)	407.	(b)	408.	(c)	409.	(b)	410.	(d)
411.	(c)	412.	(d)	413.	(a)	414.	(d)	415.	(b)	416.	(b)	417.	(a)	418.	(a)	419.	(c)	420.	(a)
421.	(d)	422.	(a)	423.	(d)	424.	(b)	425.	(c)	426.	(a)	427.	(a)	428.	(c)	429.	(c)	430.	(d)
431.	(d)	432.	(b)	433.	(d)	434.	(d)	435.	(b)	436.	(d)	437.	(d)	438.	(c)	439.	(c)	440.	(d)
441.	(d)	442.	(c)	443.	(d)	444.	(c)	445.	(b)	446.	(d)	447.	(b)	448.	(a)	449.	(a)	450.	(c)
451.	(a)	452.	(c)	453.	(a)	454.	(a)	455.	(c)	456.	(d)	457.	(d)	458.	(d)	459.	(b)	460.	(c)
461.	(c)	462.	(b)	463.	(c)	464.	(c)	465.	(c)	466.	(b)	467.	(d)	468.	(a)	469.	(d)	470.	(c)
471.	(c)	472.	(b)	473.	(d)	474.	(c)	475.	(b)	476.	(a)	477.	(b)	478.	(d)	479.	(d)	480.	(b)
481.	(c)	482.	(d)	483.	(d)	484.	(b)	485.	(b)	486.	(d)	487.	(d)	488.	(a)	489.	(a)	490.	(d)
491.	(c)	492.	(b)	493.	(c)	494.	(c)	495.	(d)	496.	(d)	497.	(a)	498.	(d)	499.	(a)	500.	(c)
501.	(a)	502.	(a)	503.	(b)	504.	(a)	505.	(b)	506.	(a)	507.	(a)	508.	(b)	509.	(c)	510.	(b)
511.	(c)	512.	(b)	513.	(d)	514.	(d)	515.	(a)	516.	(b)	517.	(d)	518.	(a)	519.	(b)	520.	(b)
521.	(d)	522.	(a)	523.	(c)	524.	(b)	525.	(b)	526.	(a)	527.	(b)	528.	(b)	529.	(b)	530.	(b)
531.	(d)	532.	(c)	533.	(a)	534.	(d)	535.	(b)	536.	(c)	537.	(d)	538.	(c)	539.	(a)	540.	(c)
541.	(c)	542.	(a)	543.	(c)	544.	(c)	545.	(a)	546.	(d)	547.	(c)	548.	(c)	549.	(d)	550.	(c)
551.	(a)	552.	(b)	553.	(c)	554.	(a)	555.	(a)	556.	(a)	557.	(c)	558.	(d)	559.	(a)	560.	(a)
561.	(a)	562.	(a)	563.	(b)	564.	(c)	565.	(d)	566.	(d)	567.	(d)	568.	(d)	569.	(c)	570.	(d)
571.	(a)	572.	(a)	573.	(c)	574.	(d)	575.	(d)	576.	(d)	577.	(b)	578.	(c)	579.	(d)	580.	(d)
581.	(c)	582.	(d)	583.	(c)	584.	(b)	585.	(d)	586.	(d)	587.	(d)	588.	(a)	589.	(d)	590.	(c)
591.	(b)	592.	(b)	593.	(a)	594.	(a)	595.	(d)	596.	(c)	597.	(b)	598.	(c)	599.	(b)	600.	(d)
601.	(b)	602.	(a)	603.	(b)	604.	(c)	605.	(d)	606.	(d)	607.	(b)	608.	(c)	609.	(c)	610.	(a)
611.	(a)	612.	(b)	613.	(b)	614.	(c)	615.	(c)	616.	(d)	617.	(b)	618.	(c)	619.	(a)	620.	(b)
621.	(a)	622.	(b)																

SOLUTIONS

1. (a)



$\angle ECD = 105°$ (Given)

$\therefore \angle ECF = 180° - 105° = 75°$ (Straight line angle)

$\angle EAB = 45°$ (Given)

$\therefore \angle EFC = \angle EAB = 45°$ (Corresponding angle)

In ΔEFC,

$x° = 180° - (75° + 45°)$

$= 180° - 120°$

$\therefore x° = 60°$

Alternate Method:

FD || AB

$\angle FAB = \angle EFD = 45°$ (Corresponding angle)

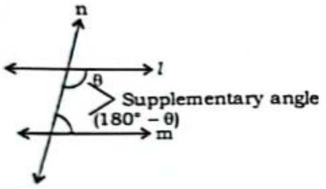
In ΔEFC,

$\angle E + \angle EFD = \angle ECD$ (Exterior angle property)

$\Rightarrow x° + 45° = 105°$

$\therefore x° = 60°$

2. (d)



ATQ,

$\theta - (180° - \theta) = 40°$

$\Rightarrow \theta + \theta - 180° = 40°$

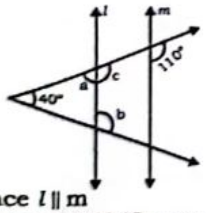
$\Rightarrow 2\theta = 220°$

$\Rightarrow \theta = 110°$

Hence, the smallest angle

$= 180° - 110° = 70°$

3. (c)



since $l \parallel m$

$\Rightarrow \angle c = 110°$ (Corresponding angle)

$\Rightarrow \angle a = 180° - 110° = 70°$ [Linear angle]

$\therefore \angle b = 40° + \angle a$ [Exterior angle property]

$= 40° + 70° = 110°$

4. (d)

(i) Sum of all interior angle is 180°. It is true.

(ii) All interior angles cannot be equal. It is false statement just look the example of equilateral. This triangle has all equal angles.

(iii) Can have at the most one obtuse angle. It is true statement. If you take two obtuse angle it will be more than 180°

(iv) Sum of two sides may or may not be equal to the third side. It is a false statement which is not satisfied the condition of a triangle.

$a + b > c$

5. (a) The sum of angles of a triangle is always 180°

$30° + 60° + 90° = 180°$

Only option (a) satisfy the above property.

6. (b) $\angle R = 180° - (\angle P + \angle Q)$

$= 180° - 84° = 96°$

7. (d) $\frac{\pi}{6} = 30°,\ \frac{\pi}{3} = 60°,\ \frac{\pi}{2} = 90°$

$$\frac{\pi}{3} = \frac{\frac{\pi}{6} + \frac{\pi}{2}}{2} \Rightarrow \frac{\pi}{3} = \frac{\pi + 3\pi}{12}$$

$$\Rightarrow \frac{\pi}{3} = \frac{\pi}{3}$$

Alternate Method:

option (1)

$\frac{\pi}{6} = 30°,\ \frac{\pi}{3} = 60°,\ \frac{\pi}{2} = 90°$

$\because$ Sum of the angle of triangle = 180°

$\therefore$ Only option (d) is satisfied.

8. (c) Since $(x - 46)°$, $(x + 96)°$ and $8x°$ are angles of Δ

ATQ,

$(x - 46)° + (x + 96)° + 8x° = 180°$

$\Rightarrow 10x° = 180° + 46° - 96°$

$\Rightarrow 10x° = 180° - 50°$

$\Rightarrow 10x° = 130°$

$\Rightarrow x = 13°$

$\therefore 2x = 13° \times 2 = 26°$

9. (b) Sum of angle of Δ = 180°

ATQ,

$\Rightarrow 7x + 8x + 3x = 180°$

$\Rightarrow 18x = 180°$

$\Rightarrow x = 10°$

Largest $\rightarrow 8x = 8 \times 10 = 80°$

10. (a) Sum of all angle of Δ = 180°

Now,

$x + 2x + 3x = 180°$

$\Rightarrow 6x = 180° \Rightarrow x = 30°$

Diff. $= 3x - x = 2x = 2 \times 30 = 60°$

Alternate Method:

6 unit = 180°

(3 – 1) = 2 unit = 60°

11. (a) Given,

$(17 + 13 + 15) = 45$ unit $\rightarrow 180°$

Then, $(17 - 13) = 4$ unit $\rightarrow \frac{180°}{45} \times 4 = 16°$

12. (b) Ratio $\Rightarrow 9 : 11 : 16 = 36$ units

7 units

$\because$ 36 units = 180°

$\therefore$ 7 units $= \frac{180°}{36} \times 7 = 35°$

13. (a) Sum of all 3 angles of a triangle = 180°

$\Rightarrow x + x + 2x = 180°$

$\Rightarrow 4x = 180°$

$\Rightarrow x = 45°$

Largest angle = 90°

Required% $= \frac{90}{180} \times 100 = 50\%$

Alternate Method:

Angles ratio = 1 : 1 : 2

Total = 4

Largest = 2

Req.% $= \frac{2}{4} \times 100 = 50\%$

14. (d) Let $\angle C = x$

$\angle B = 18° + x$

$\angle A = 33° + 18° + x$

$x + x + 18° + x + 18° + 33° = 180°$ (By angle sum property)

$\Rightarrow 3x + 69° = 180°$

$\Rightarrow 3x = 111°$

$\Rightarrow x = 37°$

$\therefore$ Smallest + largest $= (x) + (x + 18° + 33°) = 37° + 37° + 51° = 125°$

15. (d) Given,

$P - Q = 20° \Rightarrow P = 20° + Q$ ....(i)

$Q - R = 26° \Rightarrow R = Q - 26°$ ....(ii)

and $P + Q + R = 180°$ ....(iii)

Put (i) and (ii) in (iii)

$20° + Q + Q - 26 + Q = 180°$

$\Rightarrow 3Q = 180° + 6 \Rightarrow Q = \frac{186}{3} = 62°$

$\therefore P = 20° + Q = 82°$

16. (d) In ΔABC

$\angle A + \angle B + \angle C = 180°$

$\Rightarrow \angle B + \angle C = 180° - \angle A$ .....(i)

Given,

$\frac{1}{2}\angle A + \angle B + \angle C = 120°$

$\Rightarrow \frac{1}{2}A + 180° - \angle A = 120°$

$\Rightarrow \frac{-\angle A}{2} = 120° - 180°$

$\Rightarrow \angle A = 120°$

$\therefore \frac{1}{4}\angle A = \frac{1}{4} \times 120° = 30°$

Alternate Method:

$\frac{1}{2}\angle A + \angle B + \angle C = 120°$ ....(i)

$\angle A + \angle B + \angle C = 180°$ ....(ii)

(ii) – (i)

$\Rightarrow \frac{1}{2}\angle A = 60°$

$\therefore \frac{1}{4}\angle A = 30°$

17. (a) $2R - P = Q - R$

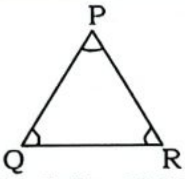
$\Rightarrow P + Q = 3R$

We know that, $P + Q + R = 180°$

$\Rightarrow 4R = 180°$

$\therefore R = 45°$

18. (a)



$4\angle P = 5\angle Q = 20\angle R$
$\Rightarrow \angle P : \angle Q : \angle R = 5 : 4 : 1$
10 unit → 180°
1 unit → 18°
$\angle Q \rightarrow 4 \text{ unit} = 4 \times 18^\circ = 72^\circ$

Alternate Method:-

Let, $4\angle P = 5\angle Q = 20\angle R = k$

$\Rightarrow \angle P = \frac{k}{4}, \angle Q = \frac{k}{5}, \angle R = \frac{k}{20}$

$\angle P + \angle Q + \angle R = 180^\circ$ (Sum of angle of a triangle is 180°)

$\Rightarrow \frac{k}{4} + \frac{k}{5} + \frac{k}{20} = 180^\circ$

$\Rightarrow \frac{10k}{20} = 180^\circ \Rightarrow k = 360^\circ$

$\therefore \angle Q = \frac{k}{5} = \frac{360^\circ}{5} = 72^\circ$

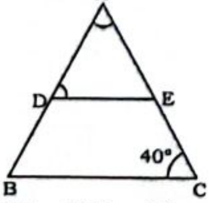
19. (b) Let, all three angle of triangle $(x-y), x, (x+y)$
ATQ,
$(x+y) - (x-y) = 50^\circ$
$\Rightarrow 2y = 50^\circ \Rightarrow y = 25^\circ$
$(x-y) + x + (x+y) = 180^\circ$
$\Rightarrow 3x = 180^\circ \Rightarrow x = 60^\circ$
Largest angle $= (x+y)$
$= 60^\circ + 25^\circ = 85^\circ$

20. (b) Let, the smallest angle $= x$
other two angles $= 2x, 3x$
So, $x + 2x + 3x = 180^\circ$
$\Rightarrow 6x = 180^\circ \Rightarrow x = 30^\circ$

21. (d) A.T.Q,
$\angle A : \angle B : \angle C$
$3 : 7 : 10$
20 unit → 180°
1 unit → 9°
It is clear that smallest angle is ∠A
$3 \text{ unit} \rightarrow 9 \times 3 = 27^\circ$

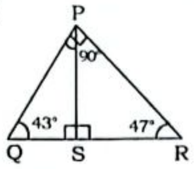
22. (c) Let smallest angle $= x$
Largest angle $= x + 42^\circ$
Other angle $= x + 24^\circ$
$x + x + 42^\circ + x + 24^\circ = 180^\circ$ (Sum of all angles of a triangle is 180°)
$\Rightarrow 3x = 180^\circ - 66^\circ \Rightarrow 3x = 114^\circ$
$\Rightarrow x = 38^\circ$

23. (c)



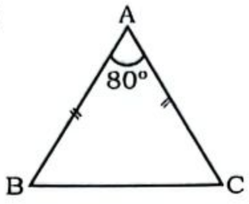
$\angle ACB = AED = 40^\circ$
(Corresponding angle)
In ΔADE,
$\angle DAE + \angle ADE + \angle AED = 180^\circ$
$\Rightarrow \angle DAE + \angle ADE = 180^\circ - \angle AED$
$\Rightarrow \angle DAE + \angle ADE = 180^\circ - 40^\circ$
$\Rightarrow \angle DAE + \angle ADE = 140^\circ$

24. (d)



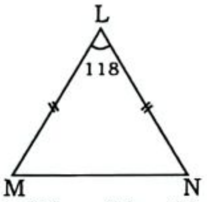
$\angle PQR = 90^\circ - 47^\circ = 43^\circ$
In ⊾PQS,
PS ⊥ QR (Given)
$\therefore \angle QPS = 90^\circ - 43^\circ = 47^\circ$

25. (a)



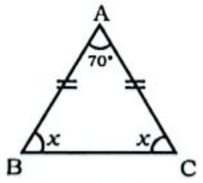
In ΔABC, AB = AC (Given)
$\Rightarrow \angle B = \angle C$
We know,
$\angle A + \angle B + \angle C = 180^\circ$ (sum of angles of a triangle is always 180°)
$\Rightarrow 2\angle B = 100^\circ$
$\Rightarrow \angle B = 50^\circ$

26. (b)



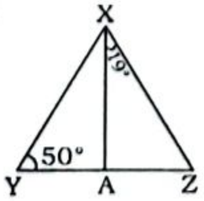
$LM = LN \Rightarrow \angle M = \angle N$
In ΔLMN
$\angle L + \angle N + \angle M = 180^\circ$ (Sum of angle of triangle is always 180°)
$\Rightarrow 118^\circ + 2\angle N = 180^\circ$ [∵ ∠L = ∠M]
$\therefore \angle N = 31^\circ$

27. (d)



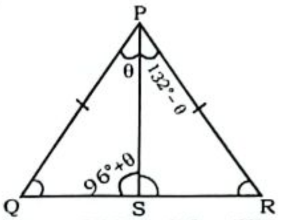
Let, $\angle C = x^\circ$, Then, $\angle B = x^\circ$
∴ [AB = AC, when two sides of triangle are equal then their opposite angles are also equal.]
$70^\circ + x^\circ + x^\circ = 180^\circ$
$\Rightarrow 2x^\circ = 110^\circ \Rightarrow \angle x = \angle C = 55^\circ$

28. (a)



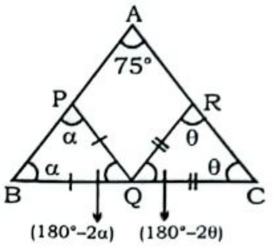
Given, XA = YA
If sides equal then angle also equal
$\angle XYA = \angle AXY = 50^\circ$
$\therefore \angle XZA = 180^\circ - 50^\circ - 50^\circ - 19^\circ = 61^\circ$

29. (c)



$\angle PQR = \angle PRQ$ (∵ PQ = PR)
$= \frac{180^\circ - 132^\circ}{2} = \frac{48^\circ}{2} = 24^\circ$
In ΔPQS, $24^\circ + \theta + 96^\circ + \theta = 180^\circ$
$\Rightarrow 2\theta = 180^\circ - 120^\circ \Rightarrow 2\theta = 60^\circ$
$\Rightarrow \theta = 30^\circ$
$\therefore \angle PSR = 180^\circ - (96^\circ + 30^\circ) = 54^\circ$

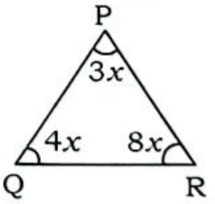
30. (b)



In ΔABC, $\alpha + \theta + 75^\circ = 180^\circ$
$\Rightarrow \alpha + \theta = 105^\circ$
∵ BQC is a straight line
$180^\circ - 2\alpha + \angle PQR + 180^\circ - 2\theta = 180^\circ$
$\Rightarrow \angle PQR = 180^\circ - 360 + 2(\alpha + \theta)$
$= -180^\circ + 2 \times 105^\circ$
$= -180^\circ + 210^\circ = 30^\circ$

SMART APPROACH:-
$\angle PQR = 180^\circ - 2 \times \angle BAC$
$= 180^\circ - 2 \times 75^\circ = 30^\circ$

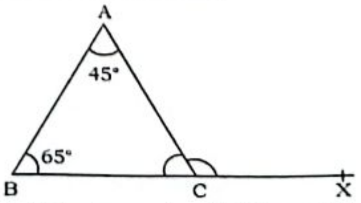
31. (d)



Let, P, Q, R = $3x, 4x, 8x$
Shortest side is opposite to smallest angle.
and longest side is opposite to largest angle
Hence, shortest side and longest sides are respectively QR and PQ

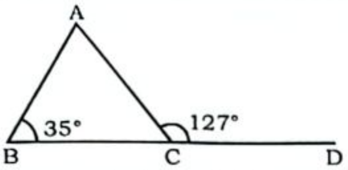
32. (a) Exterior angle = sum of opposite interior angles
$= 45^\circ + 65^\circ = 110^\circ$

Alternate Method:-



$\therefore$ Exterior angle $\angle ACX = 65^\circ + 45^\circ = 110^\circ$

33. (b)

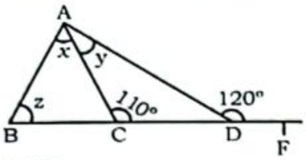


We know, exterior angle is equal to sum of opposite interior angles.

$\Rightarrow \angle ACD = \angle ABC + \angle BAC$

$\Rightarrow \angle BAC = 127° - 35° = 92°$

34. (c)



In ΔACD,

$\Rightarrow y = 120° - 110°$ (Exterior angle property)

$\Rightarrow y = 10°$

In ΔABC,

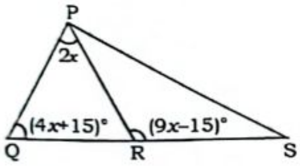
$\Rightarrow x + z = 110°$ (Exterior angle property)

$\therefore x + y + z = 110° + 10° = 120°$

Alternate Method:

In ΔABD, $x + y + z = 120°$ (Exterior angle property)

35. (c)



In ΔPQS

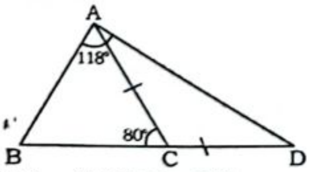
$\angle PRS = \angle PQR + \angle QPR$

[Exterior Angle]

$\Rightarrow 9x - 15° = 4x + 15° + 2x$

$\Rightarrow 3x = 30° \Rightarrow x = 10°$

36. (c)



$\angle CAD = \angle ADC (AC = CD)$

$\angle CAD = \angle ADC = 40°$ (External angle property)

$\angle BAC = 118° - 40° = 78°$

In ΔABC,

$\angle ABC + \angle ACB + \angle BAC = 180°$ (Sum of angles of a traingle is always 180°)

$\Rightarrow \angle ABC + 80° + 78° = 180° \Rightarrow \angle ABC = 22°$

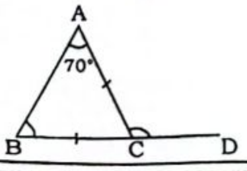
Alternate Method:

$\angle ACB = \angle CAD + \angle ABC$ (Exterior angle property)

So $\angle CAD = \angle ADC = 40°$ $(AC = CD)$

$\angle ABC = 180° - (118° + 40°) = 22°$

37. (a)



$AC = BC$

$\Rightarrow \angle CAB = \angle CBA = 70°$ (Isosceles triangle property)

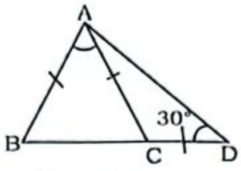
$\angle ACD = \angle ABC + \angle BAC$ (Ext. angle property)

$\angle ACD = 70° + 70° = 140°$

$\therefore \angle ACD - \angle ABC = 140° - 70°$

$= 70°$

38. (c)



$AB = AC = CD$

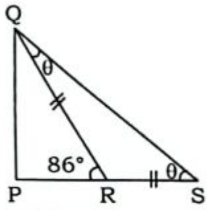
$\Rightarrow \angle ADC = \angle CAD = 30°$

$\angle ACB = 60°$ (Exterior angle property)

$AB = AC \Rightarrow \angle ABC = 60°$

$\therefore \angle BAC = 60°$

39. (c)



In ΔRQS

$QR = RS$

Then, $\angle RQS = \angle RSQ = \theta$

[∵ Length of side is equal. So, their opposite angles will also be equal]

In ΔRQS

$\angle R$ is an exterior angle

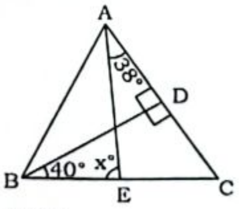
So, $\angle R = \angle Q + \angle S$

[∵ Exterior angle is equal to the sum of the opposite interior angle]

$86° = \theta + \theta$

$\Rightarrow 2\theta = 86° \Rightarrow \theta = 43°$

40. (b)



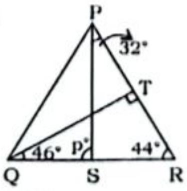
In ΔBDC,

$\angle C = 180° - 90° - 40° = 50°$

$\angle AEB = x° = 50° + 38°$ (Exterior angle)

$\Rightarrow x = 88°$

41. (c)



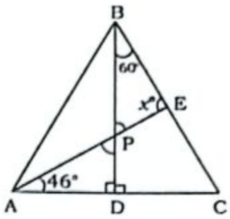
In ΔQTR,

$\angle R = 90° - 46° = 44°$

$\angle PSQ = 32° + 44°$ (exterior angle)

$\therefore p = 76°$

42. (a)



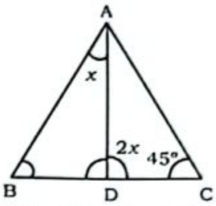
In ΔAPD, $\angle APD = 180° - 90° - 46°$
$= 44°$

$\angle APD = \angle BPE = 44°$
(vertically opposite angle)

In ΔBPE, $x + 44° + 60° = 180°$

$\Rightarrow x = 76°$

43. (a)



$\angle BAC = 77°, \angle C = 45°$

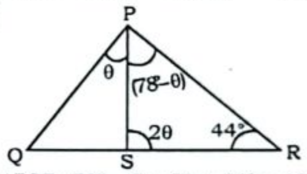
$\Rightarrow \angle B = 180° - (77° + 45°) = 58°$

Also, $2x = x + 58°$ (Exterior angle)

$\Rightarrow x = 58°$

$\therefore \angle ADB = 180° - 2 \times 58° = 64°$

44. (b)



In ΔPSR, $78° - \theta + 2\theta + 44° = 180°$

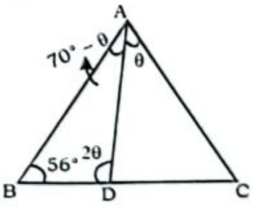
$\Rightarrow \theta = 58°$ (angle sum property)

$\angle PSQ = 180° - 2\theta = 180° - 2 \times 58°$

(Straight angle)

$= 180° - 116° = 64°$

45. (a)



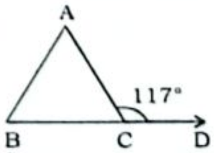
In ΔABD,

$70° - \theta + 56° + 2\theta = 180°$

$\Rightarrow \theta = 180° - 126° = 54°$

$\therefore \angle ADC = 180° - 2\theta = 180° - 2 \times 54°$
$= 180° - 108° = 72°$

46. (b)



We know,

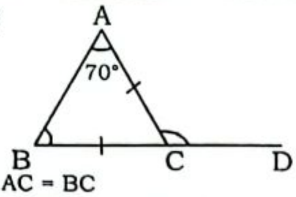
$\angle ACD = \angle BAC + \angle ABC$ [Exterior angle]

$\Rightarrow 117° = \angle BAC + \frac{5}{8}\angle BAC$

$\Rightarrow 117° = \frac{13}{8}\angle BAC \Rightarrow \angle BAC = 72°$

$\therefore \angle ABC = \frac{5}{8} \times 72° = 45°$

47. (a)



$\because$ AC = BC

$\therefore \angle BAC = \angle CBA = 70°$

Now,

$\angle ACD = \angle BAC + \angle CBA$ (exterior angle property)

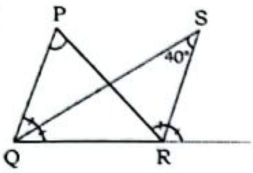
$= 70° + 70° = 140°$

Then, $2.5\angle ACD - 1.5\angle ABC$

$= \frac{5}{2} \times 140° - \frac{3}{2} \times 70°$

$= 350° - 105° = 245°$

48. (a)



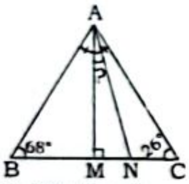
We know,

In a triangle the angle between internal bisector of a base angle and external bisector of the other base angle is half of the remaining vertex angle.

$\therefore \angle QPR = 2 \times \angle QSR$

$\Rightarrow \angle QPR = 2 \times 40° = 80°$

49. (d)



AM $\perp$ BC (given),

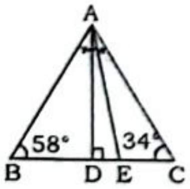
AN is angle bisector of $\angle A$

$\angle ABC = 68°, \angle ACB = 26°$

$\therefore \angle MAN = \frac{\angle B - \angle C}{2} = \frac{68° - 26°}{2}$

$= \frac{42°}{2} = 21°$

50. (a)

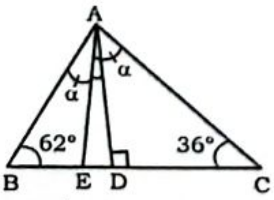


AD is perpendicular to BC and AE is the bisector of $\angle BAC$, then

$\angle DAE = \left|\frac{\angle B - \angle C}{2}\right|$

$= \left|\frac{58° - 34°}{2}\right| = \frac{24°}{2} = 12°$

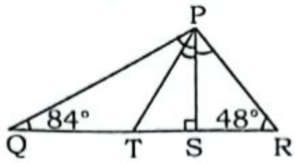
51. (a)



$\angle DAE = \frac{1}{2}(\angle B - \angle C)$

$= \frac{1}{2}(62° - 36°) = 13°$

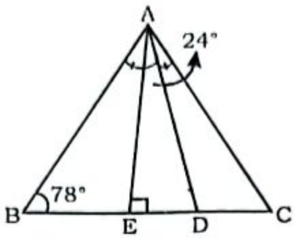
52. (d)



We know that,

$\angle SPT = \frac{\angle Q - \angle R}{2} = \frac{84° - 48°}{2} = 18°$

53. (b)



We know that,

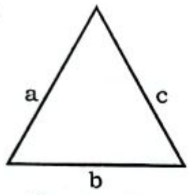
$\angle DAE = \frac{1}{2}|\angle ABC - \angle ACB|$

$\Rightarrow 24° = \frac{1}{2}|78° - \angle ACB|$

$\Rightarrow 48° = 78° - \angle ACB$

$\Rightarrow \angle ACB = 78° - 48° = 30°$

54. (c)



$\Rightarrow a + b > c$

The sum of two sides is always greater than the third side.

55. (c) Greater than third side

56. (a) In the given option, (a) 8, 6, 9 forms a triangle because

(a – b) < third side < (a + b)

$8 - 6 < 9 < 8 + 6 = 2 < 9 < 14$

on putting values in this it satisfies this.

57. (a) Side are 9, 24 and S unit.

$24 - 9 < S < 24 + 9$

$15 < S < 33.$

Note:- In a triangle difference of any two sides is always less than third side and sum of two sides must be greater than third side.

58. (b) $12 + 22 > m > |22 - 12|$

$34 > m > 10$ or $10 < m < 34$

59. (d) $BC - AC < AB < BC + AC$

$25 - 19 < y < 25 + 19$

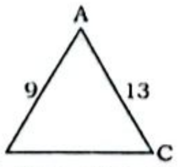
$6 < y < 44$

60. (a) Value of x lies between

$(17 - 12) < x < (17 + 12)$

$\Rightarrow 5 < x < 29$

61. (a)



$(AB + AC) > BC > |(AB - AC)|$

$\therefore (9 + 13) > BC > |9 - 13|$

$\Rightarrow 22 > BC > 4$

$\Rightarrow BC = 20$

62. (c) Possible integer value of

$x = 2 \times$ smaller side $- 1$

$= 2 \times 6 - 1 = 12 - 1 = 11$

63. (b) $12 + 7 > x > 12 - 7$

$19 > x > 5$

$x = (19 - 5) - 1 = 13$

SMART APPROACH:-

$2 \times$ smallest side $- 1$

$= 2 \times 7 - 1 = 13$

64. (a) Let a = 6, b = 18 and c = x

$b - a < c < b + a$

$18 - 6 < x < 18 + 6$

$12 < x < 24$

Possible value of x = 13,14, 15, 16, 17, 18, 19, 20, 21, 22, 23

Total no of possible value of x = 11

SMART APPROACH:-

Number of possible value of x

$= 2 \times$ smallest side $- 1$

$= 2 \times 6 - 1 = 11$

65. (d) AB = 6, BC = 11,

$11 - 6 < AC < 11 + 6$

$\Rightarrow 5 < AC < 17$

$\therefore$ AC = 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Total No. of values of AC = 11

SMART APPROACH:-

$2 \times$ smaller side $- 1 = 2 \times 6 - 1$

$= 11$

66. (a) In only triangle,

Largest side $< \frac{\text{Perimeter}}{2}$

$< \frac{52}{2}$

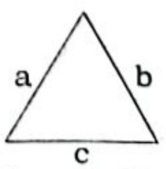
< 26

67. (a) $a + b + c = 13$

No. of possible Δs

$= \frac{(P+3)^2}{48} = \frac{16 \times 16}{48} \sim 5$

68. (a)



$a + b > c > (a - b)$

we can't take side

as 2, 5 and 7 because

$2 + 5 = 7$

so, we take side of Δ as

(2, 7, 8) and (5, 7, 8)

2 Δs are possible

69. (a) $(14 - 9) <$ Third side $< (14 + 9)$

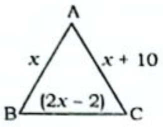
$5 <$ Third side < 23

In option 17 cm lies between 5cm and 23 cm

Note:- Any side of Δ is always greater than the diff. of other two sides and less than sum of other two sides.

70. (b) Sides are 2 cm, 3 cm, 5 cm and 6 cm
We know that to form a triangle sum of any two sides must be greater than the other side.
Number of possible Δ = 2
(3, 5, and 6)
(2, 5, and 6)

71. (d)



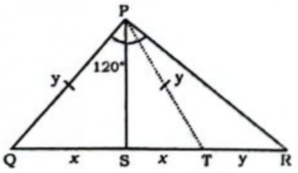
Let, AB = x
BC = $2x - 2$
AC = $x + 10$
ATQ,
Perimeter of triangle = AB + BC + AC
$\Rightarrow 40 = x + 2x - 2 + x + 10$
$\Rightarrow 40 = 4x + 8 \Rightarrow 32 = 4x \Rightarrow 8 = x$
∴ Length of smaller side = 8 cm

72. (b) Sum of all angles of a triangle = 180°
$18x + 6° + 10x + 30° + 15x + 15° = 180°$
$\Rightarrow 43x = 180° - 51° \Rightarrow x = \frac{129°}{43} = 3°$
$\therefore 18x + 6 = 54° + 6 = 60°$
$\therefore 10x + 30 = 30° + 30 = 60°$
$\therefore 15x + 15 = 45° + 15 = 60°$
Hence, it is an equilateral triangle.

73. (b) For a triangle having sum of all angles to be 180°, at least one angle has to be more than 60°.
So, option (A) incorrect.
Also, if a triangle has 2 right angles then, sum of all angles will be more than 180°.
Hence, (C) is incorrect.
A triangle with one obtuse angle and two acute angles is always possible
Option B and D are correct.

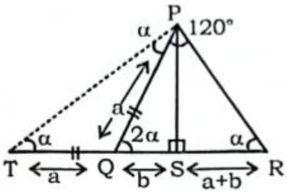
74. (b) Here XY + YZ = XZ
it means all these three points X, Y, Z are collinear and we know in a plane three collinear points never make a single circle.

75. (c)



Given,
∠P = 120°, PS ⊥ QR and PQ + QS = SR.
PT = PQ. Let PQ = y and QT = 2x,
∠PQS = θ and ∠PRQ = α
In ΔPQR, ∠PQR + ∠PRQ + ∠QPR = 180°
$\Rightarrow \theta + \alpha = 180° - 120° = 60°$ ...(i)
⇒ PQT is an isosceles triangle and PS ⊥ QR
⇒ QS = ST = x
⇒ ∠PTQ = θ.. (PQ = PT)
And ∠QPT = 180° – 2θ
Now, PQ + QS = SR ..... (Given)
$\Rightarrow y + x = x + TR$
⇒ TR = y
⇒ PT = TR = y
⇒ ∠PRT = ∠TPR = α ....(PT = TR)
ATQ,
∠QPT + ∠TPR = 120°
$\Rightarrow 180° - 2\theta + \alpha = 120°$
$\Rightarrow 2\theta - \alpha = 60°$ .....(ii)
Add eq. (i) and (ii)
$\Rightarrow \theta = 40°$

Alternate Method:

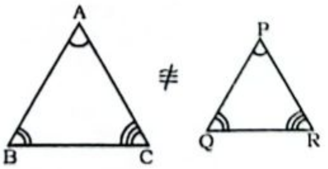


Extend RQ to T such that PQ = TQ,
Let, ∠PTQ = α,
⇒ ∠TPQ = α (TQ = PQ)
∴ ∠PQS = 2α (External angle property)
ΔPSR ≅ ΔPST
⇒ PS = PS
SR = TS = a + b
∠PSR = ∠PSQ = 90°
⇒ ∠PRS = ∠PTS = α
In ΔPTR, α + α + α + 120° = 180°
⇒ 3α = 60° ⇒ α = 20°
∴ ∠Q = 2α = 2 × 20° = 40°

76. (a) For congruency,
Two triangles have two equal sides and the same perimeter.

77. (b) Condition for congruence:-
(i) ASA
(ii) SAS
(iii) SSS
(iv) RHS
So, angle-angle-angle is not a criteria of congruency.

78. (b)

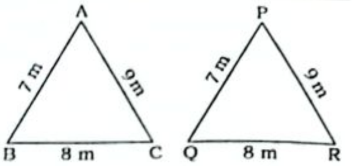


ΔABC ≇ ΔPQR (AAA)

79. (a) Two triangles are congruent if the size and shape of the triangles is equal.
So, Option (a) is wrong.

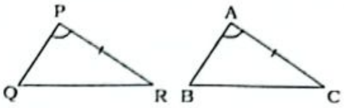
80. (b) If ΔABC ≅ ΔDEF,
Perimeter of ΔABC = Perimeter of ΔDEF
Hence, option (b) is correct statement

81. (d)



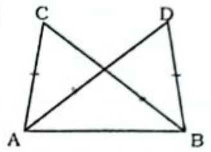
Since corresponding sides of congruent triangles are equal. and AB = PQ, AC = PR and BC = OR
ΔABC ≅ ΔPQR

82. (d)



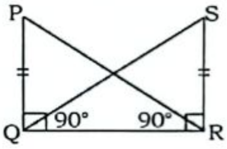
∠P = ∠A (Given)
PR = AC (Given)
If two sides of different Δ and angle between those sides are equal then both Δ are congruent.
∴ PQ = AB by SAS criteria

83. (b)



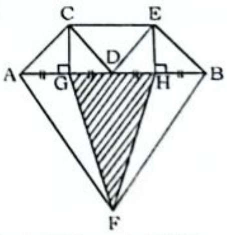
AC = BD (Given)
BC = AD (Given)
and AB = AB (Common)
ΔABC ≅ ΔBAD (by SSS property)

84. (d)



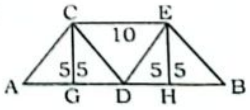
In, ΔPQR and ΔSRQ,
PQ = SR (given)
∠PQR = ∠SRQ = 90°
QR = QR (common side)
∴ ΔPQR ≅ ΔSRQ by SAS

85. (b)



(i) In ΔACG and ΔBEH,
∠G = ∠H = 90°
AG = BH (Given)
CG = HE
ΔACG ≅ ΔBEH (SAS)

(ii)



ΔCDE ≅ ΔDEB ≅ ΔDCA
(iii) ΔHFB and ΔAFG are not congruent.
(i) and (ii) are correct.

86. (a) If two triangles are congruent then the side, angle and area of Δ are equal.

$\Delta EFG \cong \Delta HIJ$

Area of $\Delta EFG = 124\ cm^2$

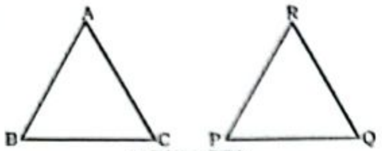
$\therefore$ Area of $\Delta HIJ = 124\ cm^2$

87. (a) $\Delta PQR \cong \Delta ABC$

$\therefore$ Area of ΔPQR

= Area of $\Delta ABC = 225\ cm^2$

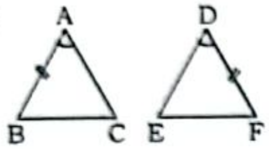
88. (d)



$\Delta ABC \cong \Delta RPQ$

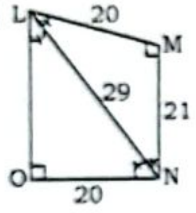
Corresponds side of PQ = BC

89. (d)



SAS theorem if angle included in two sides in equal then, AC = DE

90. (d)



ATQ.

$\therefore \angle LON = \angle LMN = 90°$

LN = LN (common side)

$\angle OLN = \angle NLM$ (angle bisector)

$\therefore \Delta LON \cong \Delta LMN$ (By ASA)

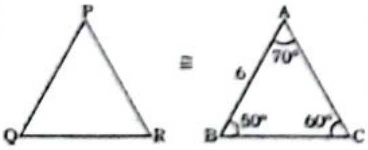
In ΔLMN,

$MN^2 = 29^2 - 20^2 \Rightarrow MN = 21$

$\therefore$ Perimeter of $\Delta LMN = 29 + 20 + 21$

$= 70$ cm

91. (d)

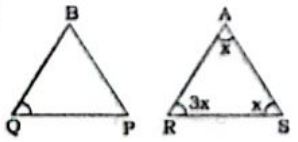


Since $\Delta PQR \cong \Delta ABC$.

AB = PQ = 6 cm

Then, $\angle C = \angle R = 60°$

92. (a)



$\angle A = \frac{1}{3}\angle R = \angle S$ (Given)

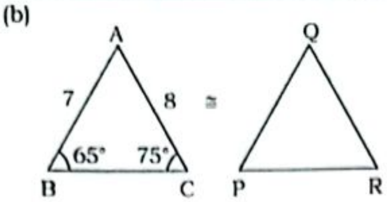
$\Delta BPQ \cong \Delta ASR \Rightarrow \angle Q = \angle R$

In ΔASR, $x + 3x + x = 180°$.

$\Rightarrow 5x = 180° \Rightarrow x = 36°$

$\therefore \angle Q = 3x = 108°$

93. (b)

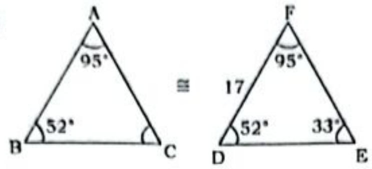


Since, ΔABC and ΔQPR are Congruent. So their correspondent side and angle will be same.

AB = QP = 7 cm and $\angle C = \angle R = 75°$

Hence, option (b) is correct.

94. (b)



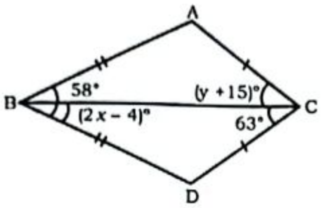
Since, $\Delta ABC \cong \Delta FDE$

$\Rightarrow AB = DF = 17$ cm

and $\angle C = 180° - 95° - 52° = 33°$

and $\angle C = \angle E = 33°$

95. (b)



In ΔABC and ΔDBC

AB = BD, AC = CD, BC = BC

$\Rightarrow \Delta ABC \cong \Delta DBC$ (By SSS)

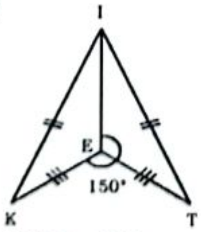
$\Rightarrow \angle ABC = \angle DBC$

$\Rightarrow 2x - 4 = \frac{58°}{2} \Rightarrow 2x = 33°$

Also, $y + 15° = 63° \Rightarrow y = 48°$

$\therefore 2x + 5y = 33° + 5 \times 48° = 273°$

96. (c)



In ΔIEK & ΔIET

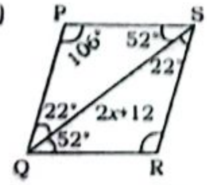
$\Delta KEI \cong \Delta TEI$ (By SSS)

$\Rightarrow \angle KEI = \angle IET = x$ (say)

$\Rightarrow 2x + 150° = 360°$ (complete angle)

$\Rightarrow x = 105°$

97. (b)



Given, $\Delta QPS \cong \Delta SRQ$

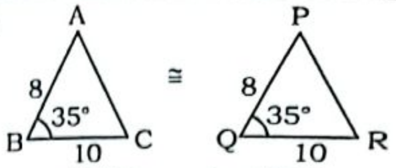
$\Rightarrow \angle P = \angle R = 106°$

In ΔSRQ, $\angle S = 22°$

In ΔQPS, $\angle Q = 22°$

$\therefore \angle PSR = (52° + 22°) = 74°$

98. (a)



Since ΔABC and ΔPQR are congruent. Then corresponding angles be same.

$\angle A = \angle P$ and $\angle C = \angle R$

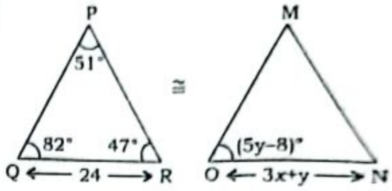
$\therefore$ In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\Rightarrow \angle P + 35° + \angle C = 180°$

$\therefore \angle P + \angle C = 145°$

99. (d)



$\Delta PQR \cong \Delta MON$

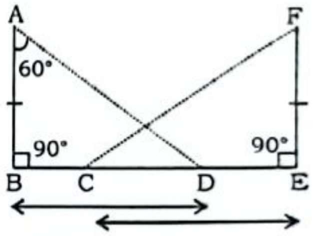
$\Rightarrow (5y - 8)° = 82° \Rightarrow 5y = 90° \Rightarrow y = 18$

and $3x + y = 24$

$\Rightarrow 3x + 18 = 24 \Rightarrow x = 2$

$\therefore x + y = 2 + 18 = 20$

100. (d)



In ΔABD and ΔFEC,

AB = FE (given)

BD = CE (given)

$\angle BAD = 60°$ (given)

$\angle B = \angle E = 90°$

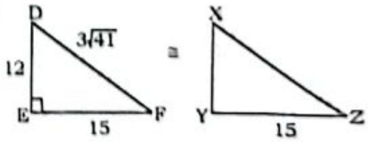
$\Delta ABD \cong \Delta FEC$ (from SAS)

$\Rightarrow \angle F = 60°$

$\therefore \angle FCE = 180° - 90° - 60° = 30°$

$\therefore \frac{\angle BAD}{\angle FCE} = \frac{60°}{30°} = \frac{2}{1} = 2:1$

101. (a)



Since, $\Delta DEF \cong \Delta XYZ$

So, their corresponding sides be equal.

DE = XY = 12

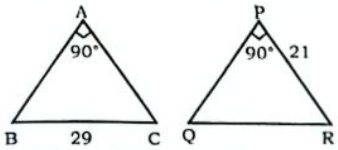
EF = YZ = 15

and, DF = XZ

So, $XZ = \sqrt{12^2 + 15^2}$

$= \sqrt{144 + 225} = \sqrt{369} = 3\sqrt{41}$

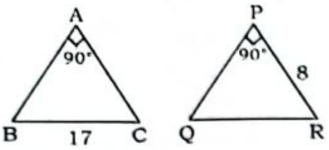
102. (b)


A
90°
B
29
C
P
90°
21
Q
R

∵ ΔABC ≅ ΔPQR (Given)
AB = PQ, BC = QR, AC = PR
So, AC = 21
∴ $BC^2 = AC^2 + AB^2$
⇒ $29^2 - 21^2 = AB^2$
⇒ $AB^2 = 400$ ⇒ AB = 20

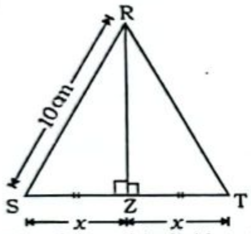
Note:- Used triplet (20, 21, 29)

103. (d)


A
90°
B
17
C
P
90°
8
Q
R

Since, ABC ≅ PQR
AC = PR = 8 cm
(Corresponding sides are equal)
BC = QR = 17 cm
In ΔABC,
$AB^2 = BC^2 - AC^2$
⇒ $AB^2 = 17^2 - 8^2$
⇒ $AB = \sqrt{9 \times 25} = 3 \times 5 = 15$ cm

104. (b)

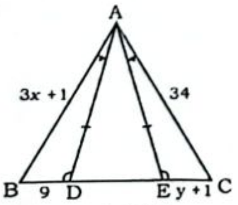

R
10cm
S
Z
T
x
x

∵ RZ ⊥ ST, and it divides side ST in two equal parts.
Then, ΔRST must be an isosceles triangle.
So, RS = RT = 10 cm

Alternate Method:

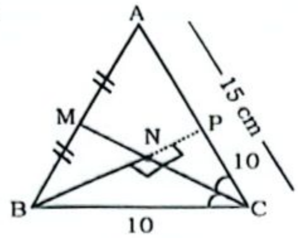
In ΔRZS & ΔRZT
SZ = ZT (Given)
∠RZS = ∠RZT = 90°
RZ = RZ (Common)
∴ ΔRZS ≅ ΔRZT
Then,
RS = RT = 10 cm

105. (c)


A
3x + 1
34
B
9
D
E
y + 1
C

In ΔBAD and ΔEAC
∠BAD = ∠EAC (Given)
AD = AE (Given)
∠ADB = ∠AEC
∴ ΔBAD ≅ ΔCAE(By ASA)
3x + 1 = 34 ⇒ 3x = 33 ⇒ x = 11
y + 1 = 9 ⇒ y = 8
∴ x + y = 11 + 8 = 19

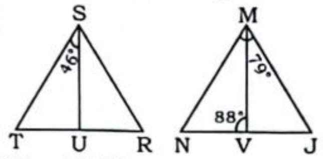
106. (a)


A
M
N
P
15 cm
10
B
10
C

In ΔCBN and ΔCPN,
NC = NC (common)
∠BCN = ∠PCN (Given)
∠CNB = ∠CNP (each 90°)
⇒ CBN ≅ ΔCPN (By ASA)
⇒ NP = NB i.e N is the midpoint of BP
CP = CB = 10 cm
AP = 15 – 10 = 5 cm

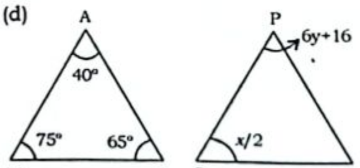
In ΔABP, MN = $\frac{1}{2}$ AP = $\frac{1}{2}$ × 5 = 2.5 cm

107. (a)


S
46°
T
U
R
M
79°
88°
N
V
J

ΔSTR ≅ ΔMNJ
∠TSU = ∠NMV = 46°
∠VMJ = 79° – 46° = 33°
∠MJV + VMJ = 88° (External angle peroperty)
⇒ ∠MJV + 33° = 88° ⇒ ∠MJV = 55°
∠MJV = ∠SRT = 55°
∴ $\frac{7}{11} \times \angle SRT = \frac{7}{11} \times 55° = 35°$

108. (d)


A
40°
75°
65°
M
N
P
6y+16
x/2
C
T

ΔMAN ≅ ΔCPT

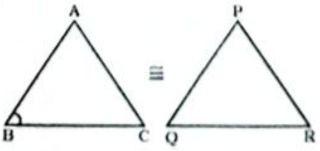
Then, ∠M = ∠C, ∠A = ∠P

∴ $\frac{x}{2} = 75° \Rightarrow x = 150°$

∴ 6y + 16 = 40° ⇒ y = 4°

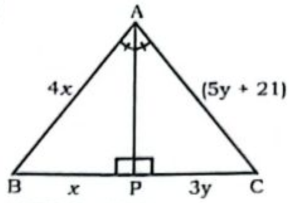
Now, x – 5y = 150° – 5 × 4° = 130°

109. (d)



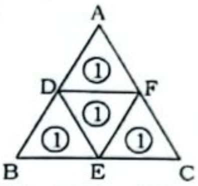
∠ABC = (x + 60°), ∠PQR = (85° – 4x)
ΔABC ≅ ΔPQR
∠B = ∠Q
⇒ x + 60° = 85° – 4x
⇒ 5x = 25° ⇒ x = 5°
∴ ∠ABC = x + 60° = 65°

110. (c)


A
4x
(5y + 21)
B
x
P
3y
C

In ΔABP & ΔAPC
∠BAP = ∠CAP
∠APB = ∠APC = 90°
AP = AP
∴ ΔABP ≅ ΔACP (By ASA)
∴ 4x = 5y + 21
⇒ 4x – 5y = 21 ......(i)
Also, x = 3y ......(ii)
From (i) and (ii)
y = 3, x = 9
∴ x + y = 12

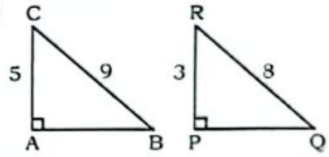
111. (d)


A
D
F
①
①
①
①
B
E
C

ΔDEF ≅ BDE ≅ ADF ≅ EFC

But Δ DEF ≇ Δ ABC

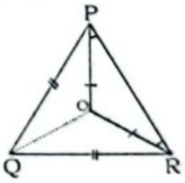
112. (b)


C
5
9
A
B
R
3
8
P
Q

AC ≠ PR
BC ≠ QR
AB ≠ PQ

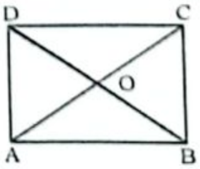
So, ΔABC ≇ ΔPQR

113. (b)



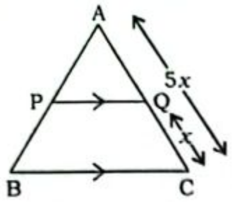
∴ PQ = QR
Then ΔPQR is a isosceles Δ.
(I) is true
In ΔPOQ and ΔQOR
PQ = QR (Given)
PO = OR (∴ ∠OPR = ∠ORP)
OQ = OQ
ΔPOQ ≅ ΔQOR
(III) is true.
Hence, option (b) is right answer.

114. (c)



In parallelogram ΔAOD ≅ ΔCOB
ΔAOB ≅ ΔCOD
and ΔDAB ≅ ΔDCB
ΔABC ≅ ΔADC
So, option (c) is not correct

115. (b)

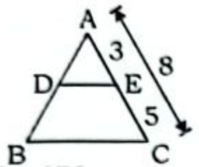


PQ || BC

$AQ = 5x - x = 4x$

$\therefore \frac{PQ}{BC} = \frac{4x}{5x} = \frac{4}{5}$

116. (d)



$5AE = 3EC$

$\Rightarrow \frac{AE}{EC} = \frac{3}{5}$

$\Rightarrow \frac{AE}{EC} = \frac{AD}{DB} = \frac{3}{5}$ (By, thales theorem)

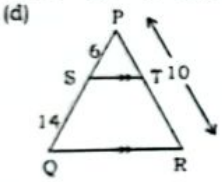
Now,

$8x \rightarrow 6.4$ units

$x \rightarrow 0.8$ unit

$\therefore DB = 5x = 5 \times 0.8 = 4$ units

117. (d)

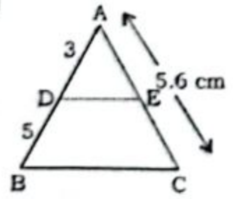


ST ∥ QR

$\Rightarrow \frac{PS}{PQ} = \frac{PT}{PR} = \frac{ST}{QR}$

$\Rightarrow \frac{6}{6+14} = \frac{PT}{10} \Rightarrow PT = 3$ cm

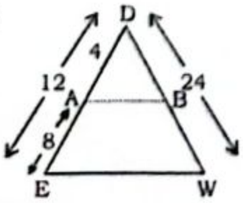
118. (b)



In ΔADE

$AE = 5.6 \times \frac{3}{8} = 2.1$ cm.

119. (a)



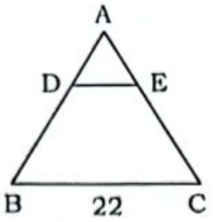
ΔDAB and ΔDEW are similar.

So, side ratio of ΔDAB and ΔDEW be same.

$AD : AE = 4 : 8 = 1 : 2$

$\therefore$ Side $DB = 24 \times \frac{1}{3} = 8$ cm.

120. (a)



Given, $AD = \frac{1}{6}AB$; $AE = \frac{1}{6}AC$

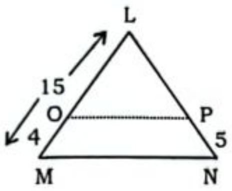
In ΔABC ~ ΔADE

By Thales law,

$DE = \frac{1}{6}BC$

$\therefore DE = \frac{1}{6} \times 22 = \frac{11}{3} = 3.67$

121. (c)



OP ∥ MN

By Thales law,

$\Rightarrow \frac{LO}{LM} = \frac{LP}{LN} \Rightarrow \frac{15-4}{15} = \frac{LP}{5+LP}$

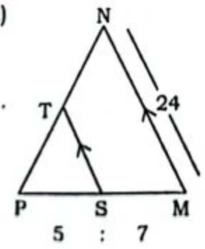
$\Rightarrow \frac{11}{15} = \frac{LP}{5+LP}$

$\Rightarrow 55 + 11\,LP = 15\,LP \Rightarrow 4\,LP = 55$

$\Rightarrow LP = \frac{55}{4} = 13.75$

$\therefore LN = 13.75 + 5 = 18.75$

122. (d)



TS ∥ MN

ΔPST ~ ΔPMN

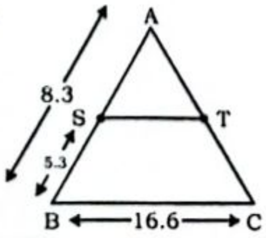
By Thales Law,

$\because \frac{PS}{PM} = \frac{ST}{MN}$

$\Rightarrow \frac{5}{(5+7)} = \frac{ST}{24}$

$\Rightarrow ST = 10$ cm

123. (a)



$AS = 8.3 - 5.3 = 3$ cm

ΔAST ~ ΔABC

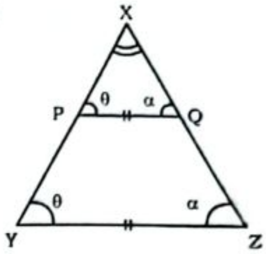
$\Rightarrow \frac{AS}{AB} = \frac{AT}{AC} = \frac{ST}{BC}$

$\Rightarrow \frac{AS}{AB} = \frac{ST}{BC}$

$\Rightarrow \frac{3}{8.3} = \frac{ST}{16.6}$

$\Rightarrow ST = 6$ cm.

124. (c)



PQ ∥ YZ

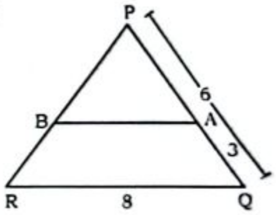
ΔXPQ ~ ΔXYZ

By Thales Law,

$\Rightarrow \frac{XP}{XY} = \frac{PQ}{YZ} \Rightarrow \frac{XP}{88} = \frac{3}{8}$

$\Rightarrow XP = 33$ cm

125. (a)



AB ∥ QR

In ΔPBA & ΔPRQ

∠P = ∠P (Common)

∠B = ∠R (Corresponding angles)

∠A = ∠Q

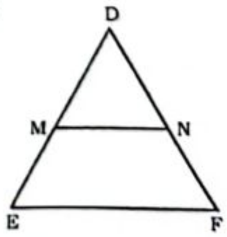
ΔPBA ~ ΔPRQ (By AAA property)

By Thales Law,

$\Rightarrow \frac{AB}{RQ} = \frac{PA}{PQ} \Rightarrow \frac{AB}{8} = \frac{3}{6}$

$\Rightarrow AB = 4$ cm

126. (d)



MN || EF

ΔDMN ~ ΔDEF

By Thales Law,

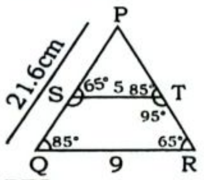
$\Rightarrow \frac{DM}{DE} = \frac{MN}{EF} = \frac{2}{5}$

DE = 60 (Given)

$\Rightarrow DM = \frac{2}{5} \times 60 = 24$

∴ ME = 60 − 24 = 36

127. (c)



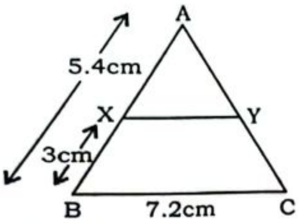
ΔPQR ~ ΔPTS

$$\Rightarrow \frac{ST}{QR} = \frac{PT}{PQ} \Rightarrow \frac{5}{9} = \frac{PT}{21.6}$$

$$\Rightarrow PT = 21.6 \times \frac{5}{9} = \frac{108}{9} = 12$$

∴ PT = 12cm

128. (c)



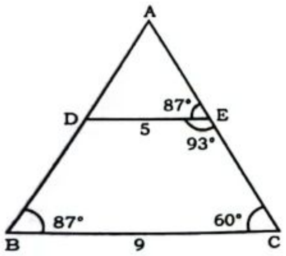
AX = 5.4 − 3 = 2.4 cm

ΔAXY ~ ΔABC

$$\Rightarrow \frac{AX}{AB} = \frac{XY}{BC} \Rightarrow \frac{2.4}{5.4} = \frac{XY}{7.2}$$

$$\Rightarrow XY = \frac{2.4 \times 7.2}{5.4} = 3.2 \text{ cm}$$

129. (c)



∠DEA = ∠ABC

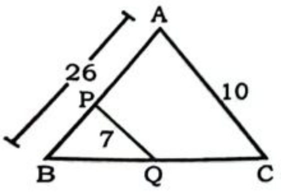
∠A = Common

⇒ ΔAED ~ ΔABC

$$\Rightarrow \frac{AE}{AB} = \frac{ED}{BC} = \frac{AD}{AC} \Rightarrow \frac{AE}{14.4} = \frac{5}{9}$$

⇒ AE = 8 cm

130. (b)



PQ || AC

∠B = ∠B (Common)

∠P = ∠A (Corresponding angles)

∠Q = ∠C

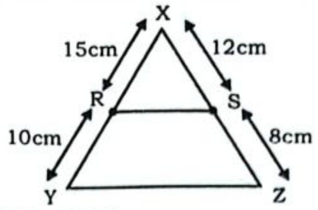
ΔBQP ~ ΔBCA (By AAA property)

$$\Rightarrow \frac{PQ}{AC} = \frac{PB}{AB} \Rightarrow \frac{PB}{26} = \frac{7}{10}$$

$$\Rightarrow PB = \frac{91}{5}$$

$$\therefore AP = AB - PB = 26 - \frac{91}{5} = 7.8 \text{ cm.}$$

131. (c)



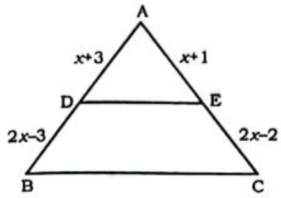
ΔXRS ~ ΔXYZ

$$\text{Here, } \frac{XR}{XY} = \frac{XS}{XZ} = \frac{3}{5}$$

By Thales Law,

$$\Rightarrow \frac{RS}{YZ} = \frac{3}{5} \Rightarrow RS = \frac{3}{5} YZ$$

132. (c)



DE || BC

ΔADE ~ ΔABC

By Thales law,

$$\Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$$

$$\Rightarrow \frac{x+3}{3x} = \frac{x+1}{3x-1}$$

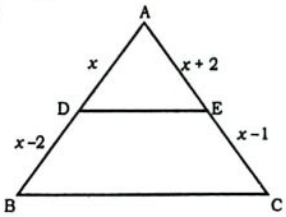
$\Rightarrow (x + 3)(3x - 1) = 3x(x + 1)$

$\Rightarrow 3x^2 + 8x - 3 = 3x^2 + 3x$

$\Rightarrow 5x = 3$

$$\therefore x = \frac{3}{5}$$

133. (a)



DE || BC

ΔADE ~ ΔABC

By Thales Law,

$$\Rightarrow \frac{AD}{AB} = \frac{AE}{AC} \Rightarrow \frac{x}{2x-2} = \frac{x+2}{2x+1}$$

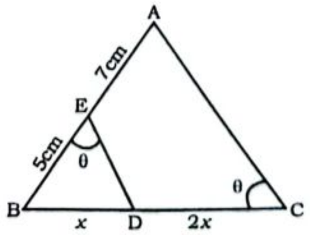
$\Rightarrow 2x^2 + x = 2x^2 + 4x - 2x - 4$

$\Rightarrow x = 4$

So, AB = 6 cm, EC = 3

∴ AB + EC = 9 cm

134. (c)



BD : CD = 1 : 2

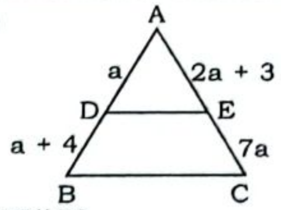
ΔEBD ~ ΔCBA

$$\Rightarrow \frac{EB}{CB} = \frac{BD}{BA} \Rightarrow \frac{5}{3x} = \frac{x}{12}$$

$\Rightarrow x^2 = 20 \Rightarrow x = 2\sqrt{5}$

$\therefore BC = 3x = 3 \times 2\sqrt{5} = 6\sqrt{5}$ cm

135. (a)



∵ DE || BC

ΔADE ~ ΔABC

By Thales Law,

$$\frac{AD}{AB} = \frac{AE}{AC}$$

$$\Rightarrow \frac{a}{a+a+4} = \frac{2a+3}{2a+3+7a}$$

$$\Rightarrow \frac{a}{2a+4} = \frac{2a+3}{9a+3}$$

$\Rightarrow 9a^2 + 3a = 4a^2 + 6a + 8a + 12$

$\Rightarrow 5a^2 - 11a - 12 = 0$

$\Rightarrow 5a^2 - 15a + 4a - 12 = 0$

$\Rightarrow 5a(a - 3) + 4(a - 3) = 0$

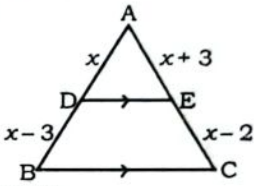
$\Rightarrow (a - 3)(5a + 4) = 0$

$\Rightarrow a - 3 = 0 \Rightarrow a = 3$

$5a + 4 = 0 \Rightarrow a = -\frac{4}{5}$ (Not possible)

∴ a = 3

136. (c)



DE || BC

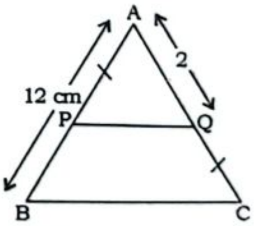
$$\Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$$

$$\Rightarrow \frac{x}{2x-3} = \frac{x+3}{2x+1}$$

$\Rightarrow 2x^2 + x = 2x^2 - 3x + 6x - 9$

$\Rightarrow -2x = -9 \Rightarrow x = 4.5$ cm

137. (b)



PQ || BC

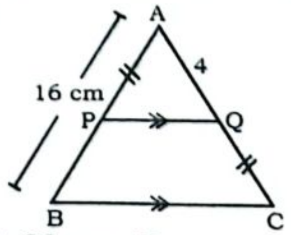
$$\Rightarrow \frac{AP}{PB} = \frac{AQ}{QC} \Rightarrow AP \times QC = AQ \times PB$$

$\Rightarrow AP^2 = 2 \times (12 - AP)$

$\Rightarrow AP^2 - 24 + 2AP = 0$

$\Rightarrow AP^2 + 6AP - 4AP - 24 = 0 \Rightarrow AP = 4$

138. (c)



Let, QC = x = AP

Then, By Thales Law,

$$\frac{AP}{AB} = \frac{AQ}{AC}$$

$\Rightarrow \frac{x}{16} = \frac{4}{4+x}$

$\Rightarrow x^2 + 4x - 64 = 0$

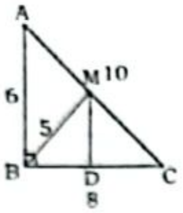
By quadratic formula,

$x = \frac{-4 \pm \sqrt{16+256}}{2}$

$\Rightarrow x = \frac{\sqrt{272} - 4}{2} = \frac{4\sqrt{17} - 4}{2}$

$= 2\sqrt{17} - 2$

139. (c)

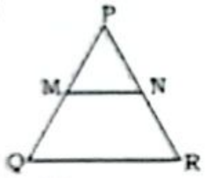


ΔBMD - ΔABC

$\Rightarrow \frac{BM}{AB} = \frac{BD}{AC} \Rightarrow \frac{5}{6} = \frac{BD}{10}$

$\Rightarrow BD = \frac{50}{6} = \frac{25}{3}$ units

140. (d)



MN| |QR

MN divides the triangle into two equal parts.

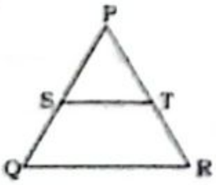
$\frac{\text{Area of } \Delta PMN}{\text{Area of } \Delta PQR} = \left(\frac{PM^2}{PQ^2}\right) \Rightarrow \frac{1}{2}$

$\left(\frac{PM}{PQ}\right) = \frac{1}{\sqrt{2}}$

$MQ = \sqrt{2} - 1$

$\therefore MQ : PQ = \sqrt{2} - 1 : \sqrt{2}$

141. (a)



QR| |ST

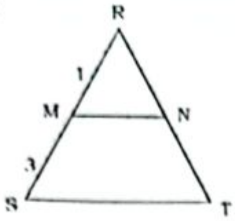
ST divides the triangle into two equal parts.

$\therefore \frac{\text{Area of } \Delta PST}{\text{Area of } \Delta PQR} = \left(\frac{PS^2}{PQ^2}\right) \Rightarrow \frac{1}{2}$

$= \left(\frac{PS^2}{PQ^2}\right) \Rightarrow \frac{PS}{PQ} = \frac{1}{\sqrt{2}}$

$\therefore PS : QS = 1 : \sqrt{2} - 1$

142. (c)

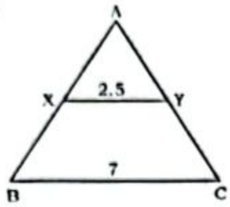


$\frac{\text{Area of } \Delta RMN}{\text{Area of } \Delta RST} = \left(\frac{RM}{RS}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

Area of MNST = 16 – 1 = 15 unit

$\therefore \frac{\text{Area of } \Delta RMN}{\text{Area of Trapezium MNTS}} = \frac{1}{15}$

143. (c)



Given, XY ∥ BC

ΔAXY ~ ΔABC

By Thales Law,

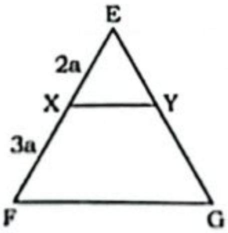
and $\frac{XY}{BC} = \frac{2.5}{7} = \frac{5}{14}$

$\therefore \frac{Ar.\Delta ABC}{Ar.\Delta AXY} = \frac{(BC)^2}{(XY)^2} = \frac{196}{25}$

$\therefore \frac{\text{Area of trapezium BCYX}}{\text{Area of } \Delta AXY}$

$= \frac{196-25}{25} = \frac{171}{25}$

144. (a)



$\frac{\text{Area of } \Delta EXY}{\text{Area of } \Delta EFG} = \frac{EX^2}{EF^2} = \frac{(2a)^2}{(5a)^2}$

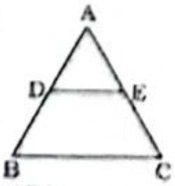
$= \frac{4}{25}$

Area of quadrilateral XFGY = 25 – 4 = 21 units

21 units = 44m² (Given)

4 units = $\frac{44}{21} \times 4 = 8.38$

145. (c)



In ΔABC

DE | | BC and DE = $\frac{1}{2}$BC

ΔABC - ΔADE

∴ ΔABC is an equilateral triangle.

Then, AB = AC = BC

And D and E are midpoint of AB and AC

AD = AE, DB = EC

AD + DB + BC = 30

⇒ AB + BC = 30

⇒ 2AB = 30 ⇒ AB = 15

Now,

$AD = DB = AE = EC = DE = \frac{15}{2} = 7.5$

Perimeter of the quadrilateral BCED

= BC + CE + ED + BD = 15 + 7.5 + 7.5 + 7.5 = 37.5

146. (c) Given, ΔMNO - ΔXYZ

Side → 9 : 4

Area → 81 : 16

$\times 3 \downarrow \quad \downarrow \times 3$

$243 \quad \boxed{48}$

∴ Area of smaller triangle = 48cm²

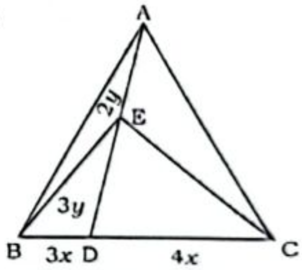
147. (a) ΔXYZ - ΔPQR

$\frac{\text{area of } \Delta XYZ}{\text{area of } \Delta PQR} = \frac{(XY)^2}{(PQ)^2}$

$\Rightarrow \frac{\text{area of } \Delta XYZ}{6} = \frac{(6)^2}{(1)^2}$

⇒ Area of ΔXYZ = 36 × 6 = 216 cm²

148. (c)



Consider, ΔAEB, ΔDEB

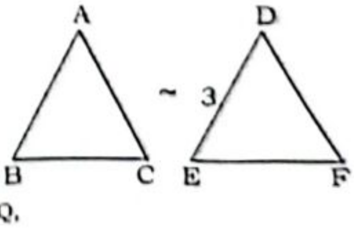
we know, ratio of area of triangle is equal to ratio of their bases.

$\Rightarrow \frac{arAEB}{arDEB} = \frac{2}{3}$ and $\frac{arDEB}{arDEC} = \frac{3}{4}$

$\Rightarrow \frac{arEBA}{arDEC} = \frac{2}{4} = \frac{1}{2}$

$\Rightarrow \frac{arECD}{arAEB} = \frac{2}{1}$

149. (a)



ATQ,

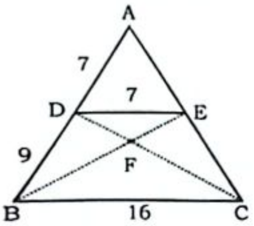
$\frac{AB}{DE} = \frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta DEF}$

$\Rightarrow \frac{AB}{3} = \frac{24}{9}$

⇒ AB = 8 cm.

	ΔABC		ΔDEF
Ratio of area →	(Side)²	:	(Side)²
	8²	:	(3)²
	64	:	9

150. (c)



DE ∥ BC

ΔADE ~ ΔABC

By Thales Law,

$$\frac{AD}{AB}=\frac{DE}{BC}=\frac{7}{7+9}=\frac{7}{16}$$

$$\therefore \frac{\text{Area of }\Delta DEF}{\text{Area of }\Delta CBF}=\frac{(7)^2}{(16)^2}=\frac{49}{256}$$

151. (a) $\left(\frac{\text{Side of triangle}_1}{\text{Side of triangle}_2}\right)^2$

$$=\frac{\text{Area of triangle}_1}{\text{Area of triangle}_2}$$

$$\Rightarrow\left(\frac{21}{S_2}\right)^2=\frac{490}{640}\Rightarrow\frac{21}{S_2}=\sqrt{\frac{49}{64}}$$

$$\Rightarrow\frac{21}{S_2}=\frac{7}{8}\Rightarrow S_2=24\text{ cm.}$$

∴ Length of coresponding side of second triangle = 24 cm.

152. (d) Let the greatest side of ΔPQR = x

ΔABC ~ ΔPQR (given)

$$\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta PQR}=\left(\frac{24}{x}\right)^2$$

$$\Rightarrow\frac{64}{144}=\left(\frac{24}{x}\right)^2$$

Taking square root-

$$\Rightarrow\frac{8}{12}=\frac{24}{x}\Rightarrow x=36$$

Alternate Method:-

$$\begin{array}{lcl}\Delta ABC & : & \Delta PQR\\ A_1 & : & A_2 = 64 : 144\\ S1 : S2 & = & \sqrt{64} : \sqrt{144}\\ & = & 8 \quad : \quad 12\\ & & \downarrow\times3 \quad \downarrow\times3\\ & & 24 \quad\quad 36\end{array}$$

Greatest side of ΔPQR = 36 cm

153. (a) In similar triangle

Area of triangle = (side)^2

So,

$$\frac{25}{144}=\frac{\text{side}_1^2}{\text{side}_2^{\,2}}\Rightarrow\frac{\text{side}_1}{\text{side}_2}=\frac{5}{12}$$

154. (b) $\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta QRP}=\frac{CB^2}{PR^2}$

$$\Rightarrow\frac{9}{4}=\frac{15^2}{PR^2}\Rightarrow PR^2=100\Rightarrow PR=10\text{ cm}$$

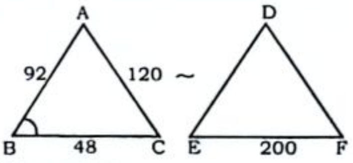
155. (b) ΔABC ~ ΔXYZ

By Thales Law,

$$\Rightarrow\frac{AC}{XZ}=\sqrt{\frac{\text{area}(\Delta ABC)}{\text{area}(\Delta XYZ)}}$$

$$\Rightarrow\frac{15}{XZ}=\frac{9}{5}\Rightarrow XZ=\frac{75}{9}=\frac{25}{3}$$

156. (d)



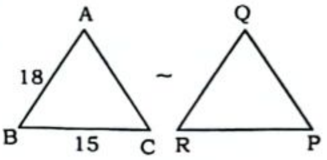
ΔABC ~ ΔDEF

$$\Rightarrow\frac{AC}{DF}=\frac{BC}{EF}\Rightarrow\frac{120}{DF}=\frac{48}{200}$$

⇒ DF = 500

∴ Largest side = 500 cm

157. (c)



$$\frac{\text{Area of }(\Delta ABC)}{\text{Area of }(\Delta QRP)}=\left(\frac{BC}{PR}\right)^2$$

$$\Rightarrow\frac{9}{4}=\left(\frac{BC}{PR}\right)^2\Rightarrow\frac{BC}{PR}=\frac{3}{2}$$

$$\Rightarrow\frac{15}{PR}=\frac{3}{2}\Rightarrow PR=10$$

158. (c) ΔABC ~ ΔDEF

$$\frac{\text{area of }\Delta ABC}{\text{area of }\Delta DEF}=\left(\frac{BC}{EF}\right)^2$$

$$\Rightarrow\frac{x^2}{y^2}=\left(\frac{BC}{a}\right)^2\Rightarrow\frac{BC^2}{a^2}=\frac{x^2}{y^2}$$

$$\Rightarrow BC=\frac{ax}{y}$$

159. (b) area ∝ side^2

$$\frac{\text{Area of }\Delta XYZ}{\text{Area of }\Delta LMN}=\frac{YZ^2}{MN^2}$$

$$\Rightarrow\sqrt{\frac{16}{25}}=\frac{2.4}{MN}$$

$$\Rightarrow\frac{4}{5}=\frac{2.4}{MN}\Rightarrow MN=3$$

160. (d) ΔABC ~ ΔDEF

$$\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta DEF}=\frac{BC^2}{EF^2}$$

$$\Rightarrow\frac{81}{144}=\frac{BC^2}{20^2}\Rightarrow\frac{9}{12}=\frac{BC}{20}$$

⇒ BC = 15 cm

161. (c)ΔABC and ΔPQR are similar.

$$\Rightarrow\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta PQR}=\frac{AC^2}{PR^2}\Rightarrow\frac{289}{576}$$

$$=\frac{AC^2}{12^2}\Rightarrow\frac{17}{24}=\frac{AC}{12}$$

⇒ AC = 8.5 cm

162. (d) ΔABC and ΔEDF are similar.

$$\Rightarrow\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta EDF}=\frac{BC^2}{DF^2}$$

$$\Rightarrow\frac{9}{4}=\frac{8^2}{DF^2}\Rightarrow\frac{9}{4}=\frac{64}{DF^2}$$

$$\Rightarrow DF^2=\frac{256}{9}\Rightarrow DF=5\frac{1}{3}\text{ cm}$$

163. (c) ΔABC ~ ΔDEF

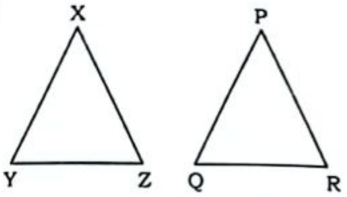
$$\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta DEF}=\frac{BC^2}{EF^2}$$

$$\Rightarrow\frac{0.64}{0.0121}=\frac{BC^2}{0.154^2}$$

$$\Rightarrow\frac{0.8}{0.11}=\frac{BC}{0.154}$$

⇒ BC = 1.12 cm

164. (c)



$$\frac{\text{Perimeter of }\Delta XYZ}{\text{Perimeter of }\Delta PQR}=\frac{XY}{PQ}=\frac{YZ}{QR}$$

$$=\frac{XZ}{PR}\Rightarrow\frac{16}{9}=\frac{XY}{3.6}$$

$$\Rightarrow XY=\frac{16\times3.6}{9}=6.4=6\frac{2}{5}\text{ cm}$$

165. (a) ΔABC ~ ΔEDF

$$\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta EDF}=\frac{BC^2}{DF^2}$$

$$\Rightarrow\frac{1}{4}=\frac{8^2}{DF^2}\Rightarrow DF^2=64\times4\text{ cm}$$

⇒ DF = 16 cm

166. (b) $\frac{\text{Area of }\Delta PQR}{\text{Area of }\Delta XYZ}=\frac{QR^2}{YZ^2}$

$$\Rightarrow\frac{12.96}{635.04}=\frac{(2.9)^2}{YZ^2}\Rightarrow\frac{3.6}{25.2}=\frac{2.9}{YZ}$$

$$\Rightarrow YZ=\frac{25.2\times2.9}{3.6}=20.3\text{ cm}$$

167. (d) ΔABC and ΔDEF are similar

$$\Rightarrow\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta DEF}=\frac{AB^2}{DE^2}\Rightarrow\frac{25}{144}=\frac{p^2}{DE^2}$$

$$\Rightarrow\frac{5}{12}=\frac{p}{DE}\Rightarrow DE=\frac{12}{5}p$$

168. (a) $\frac{\text{Area of }\Delta ABC}{\text{Area of }\Delta XYZ}=\frac{(\text{Perimeter of }\Delta ABC)^2}{(\text{Perimeter of }\Delta XYZ)^2}$

$$=\frac{4^2}{7^2}=\frac{16}{49}$$

(16 + 49) units = 195 cm^2

1 unit = 3 cm^2

∴ $\frac{1}{3}$ × Difference between their area

$$=\frac{1}{3}\times(49-16)\times3=33\text{ cm}^2$$

169. (a) $\frac{\text{Perimeter of }\Delta RST}{\text{Perimeter of }\Delta ABC}=\frac{RS}{AB}$

$$\Rightarrow\frac{26}{39}=\frac{RS}{24}\Rightarrow RS=\frac{24\times2}{3}=16\text{ cm}$$

170. (c) $\Delta ABC \sim \Delta PQR$

$$\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta PQR} = \frac{BC}{QR}$$

$$\Rightarrow \frac{36}{23} = \frac{BC}{3.8}$$

$$\Rightarrow BC = \frac{36 \times 3.8}{23} = \frac{684}{115}$$

$$= 5\frac{109}{115} \text{ cm}$$

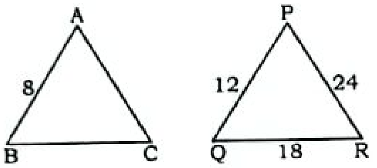
171. (b) Since, $\Delta ABC \sim \Delta PQR$

We know,

$$\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta PQR} = \frac{AB}{PQ}$$

$$\Rightarrow \frac{24}{16} = \frac{AB}{4.8} \Rightarrow AB = 7.2 \text{ cm}$$

172. (d) $\Delta ABC \sim \Delta PQR$

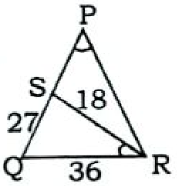


$\Rightarrow BC = 12$ cm, $AC = 16$ cm.

$\therefore$ Perimeter of $\Delta ABC = 12 + 16 + 8$

= 36 cm.

173. (c)



In ΔQPR and ΔQRS,

$\angle QPR = \angle QRS$

$\angle Q = \angle Q$ (Common)

$QR = QR$ = (Common side)

$\Delta QPR \sim \Delta QRS$

$$\Rightarrow \frac{PQ}{QR} = \frac{PR}{RS} = \frac{QR}{QS}$$

$$\Rightarrow \frac{PQ}{36} = \frac{PR}{18} = \frac{36}{27}$$

$$\Rightarrow PQ = \frac{36 \times 36}{27} = 48 \text{ cm}$$

$$PR = \frac{36 \times 18}{27} = 24$$

$\therefore PS = 48 - 27 = 21$ cm

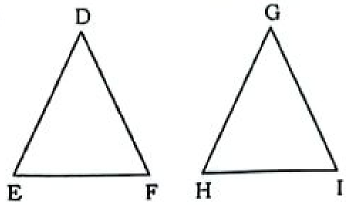
$$\therefore \frac{\text{Perimeter of } \Delta PRS}{\text{Perimeter of } \Delta QSR}$$

$$= \frac{24+18+21}{27+36+18} = \frac{63}{81} = \frac{7}{9}$$

SMART APPROACH:-

Perimeter of triangle QSR
= 27 + 36 + 18 = 81 cm
So, in required ratio, denominator must be factor of 81.
In option (c), 9 is the factor of 81
So, option (c) is correct.

174. (c)



$$\frac{\text{Perimeter of } \Delta DEF}{\text{Perimeter of } \Delta GHI} = \frac{DE}{GH} = \frac{EF}{HI} = \frac{DF}{GI}$$

$$\Rightarrow \frac{\text{Perimeter of } \Delta DEF}{72} = \frac{64}{24}$$

$$\Rightarrow \text{Perimeter of } \Delta DEF = \frac{64 \times 72}{24}$$

= 192 cm

$\therefore$ Sum of EF and FD = 192 − 64 = 128 cm

175. (c) Sum of area of two similar triangles = 2 × 706.5 = 1413 m^2

$$\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta XYZ}$$

$$= \frac{(\text{Perimeter of } \Delta ABC)^2}{(\text{Perimeter of } \Delta XYZ)^2} = \frac{6^2}{11^2}$$

$$= \frac{36}{121}$$

(36 + 121) units = 1413 m^2

1 unit = 9 m^2

20% of difference in area of both triangles = 20% of (121 − 36) × 9

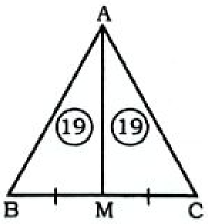
$$= \frac{1}{5} \times 85 \times 9 = 153$$

176. (d) Corresponding ratio of side of similar figure should be equal

$$\Rightarrow \frac{224}{160} = \frac{7}{5}$$

But $\frac{343}{255} \neq \frac{7}{5}$ So, d will be answer

177. (d)

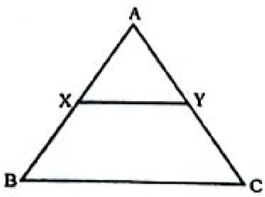


$$\frac{\text{Area of } \Delta ABM}{\text{Area of } \Delta AMC} = \left(\frac{BM}{MC}\right)^2$$

Given, area of $\Delta ABM = 19$ cm^2

So, Area of $\Delta ABC = 2 \times 19 = 38$ cm^2

178. (d)



XY ∥ BC

$\Delta AXY \sim \Delta ABC$

By Thales Law,

BC + XY = 24

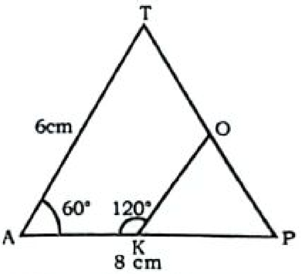
Also, $XY = \frac{1}{2}$ BC (Since, X and Y are mid points of AB & AC)

3 unit = 24

1 unit = 8

$\therefore$ BC − XY = 8

179. (c)



$\because \angle TAP + \angle OKA = 60° + 120° = 180°$ (Sum of interior angle is supplementary angle)

It is clear that-

TA ∥ KO

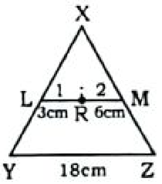
$\Delta PKO \sim \Delta PAT$

By Thales Law,

$$\Rightarrow \frac{PK}{PA} = \frac{OK}{AT}$$

$$\Rightarrow \frac{4}{8} = \frac{OK}{6} \Rightarrow OK = 3 \text{ cm}$$

180. (a)



Given,

LR : RM = 1 : 2

LR = 3 cm

1 unit → 3 cm

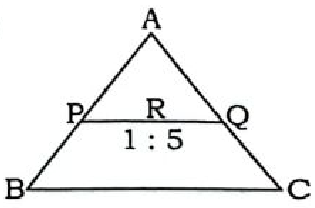
3 unit → 3 × 3 = 9 cm

L & M are mid point of XY & XZ.

$$LM = \frac{1}{2} YZ \Rightarrow YZ = 2LM$$

= 2 × 9 = 18 cm

181. (d)



As, we know,

1 unit = 6 cm

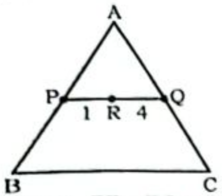
$\therefore$ PQ = 6 × 6 = 36

Then, by mid point theorem

BC = 2PQ

$\therefore$ BC = 2 × 36 = 72 cm

182. (b) A.T.Q,

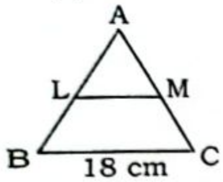


Given, PR : RQ = 1 : 4
PR = 5 cm, RQ = 20 cm
PQ = 25 cm
By Midpoint theorem,

$PQ = \frac{1}{2}$ BC

⇒ BC = 25 × 2 = 50 cm.

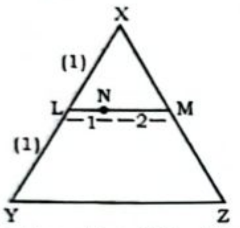
183. (d) Given,
LM | | BC



By mid-point theorem,

$LM = \frac{BC}{2} = \frac{18}{2} = 9$ cm

184. (a)

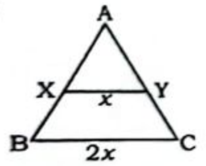

X
(1)
N
L
M
1
2
(1)
Y
Z

LN = 5 cm then LM = 5 × 3 = 15 cm
∴ L, M are mid point

So, $LM = \frac{1}{2}YZ$

∴ YZ = 15 × 2 = 30 cm

185. (b)

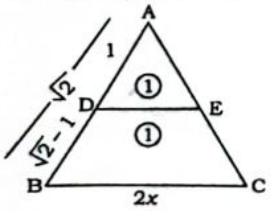


X and Y are mid point of AB and AC
By Thales Law,

$XY = \frac{1}{2}$ BC

BC + XY = 18 unit (given)
⇒ $2x + x = 18$
⇒ $x = 6$
∴ BC − XY = $(2x - x) = x = 6$

186. (d)

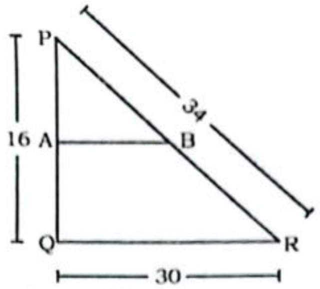

A
1
√2
D
E
①
①
√2 − 1
B
2x
C

$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \frac{1}{2}$

$\frac{AD}{AB} = \frac{1}{\sqrt{2}}$, $DB = \sqrt{2} - 1$

∴ DB : AB = $\sqrt{2} - 1 : \sqrt{2}$

187. (c)

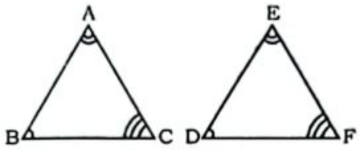

P
16
A
B
34
Q
R
30

AQ = 8 cm, BR = 17 cm
QR = 30 cm (Given)
Since, A and B are mid points
AB ∥ QR

$AB = \frac{1}{2}$ QR = 15

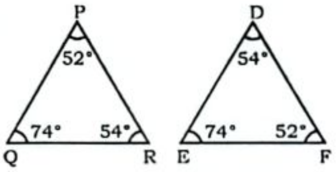
∴ Perimeter of ABRQ
= 8 + 17 + 30 + 15 = 70 cm.

188. (a)



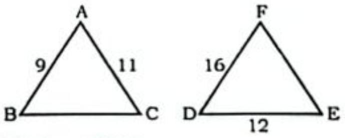
∴ ∠B = ∠D

189. (a)


P
52°
74°
54°
Q
R
D
54°
74°
52°
E
F

∠P = ∠F, ∠Q = ∠E, ∠R = ∠D
⇒ ΔPQR ~ ΔFED [AAA similarity]

190. (d)

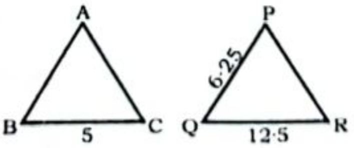

A
9
11
B
C
F
16
D
12
E

∵ ΔABC ~ ΔFDE

$\Rightarrow \frac{AB}{FD} = \frac{BC}{DE} \Rightarrow \frac{9}{16} = \frac{BC}{12}$

$\Rightarrow BC = \frac{27}{4} = 6\frac{3}{4}$ cm.

191. (b)


A
B
5
C
P
6·25
Q
12·5
R

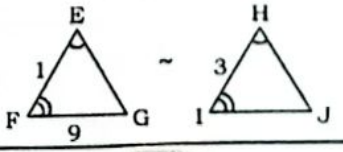
Given that,
ΔABC ~ ΔPQR

$\Rightarrow \frac{AB}{BC} = \frac{PQ}{QR} \Rightarrow \frac{AB}{5} = \frac{6 \cdot 25}{12 \cdot 5}$

⇒ AB = 2.5 cm

192. (b) Given, 3 EF = HI

$\Rightarrow \frac{EF}{HI} = \frac{1}{3}$

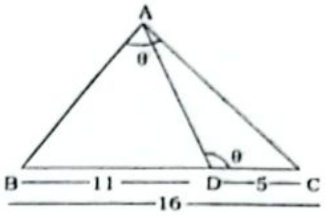


We know,
ΔEFG ~ ΔHIJ

$\Rightarrow \frac{FG}{IJ} = \frac{EF}{HI}$

$\Rightarrow \frac{9}{IJ} = \frac{1}{3} \Rightarrow IJ = 27$

193. (a)


A
θ
θ
B
11
D
5
C
16

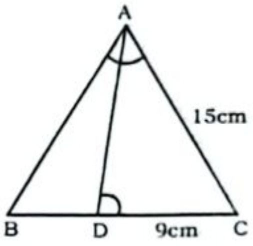
ΔACB ~ ΔDCA
∠ADC = ∠BAC (Given)
∠C = common in both Δ

$\Rightarrow \frac{BC}{AC} = \frac{AC}{CD}$

⇒ AC² = BC × CD = 16 × 5

∴ AC = $4\sqrt{5}$

194. (b)

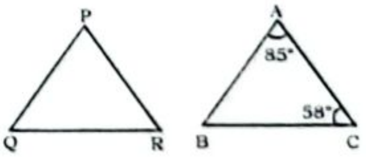

A
15cm
B
D
9cm
C

In ΔCAB and ΔCDA,
∠BAC = ∠ADC (Given)
∠ACB = ∠ACD (Common)
So, ΔCAB ~ ΔCDA (by AAS similarity)

$\frac{CA}{CB} = \frac{CD}{CA} \Rightarrow \frac{15}{CB} = \frac{9}{15}$

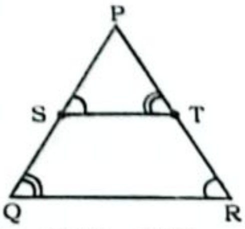
$\Rightarrow CB = \frac{(15 \times 15)}{9} = 25$

195. (b)


P
Q
R
A
85°
58°
B
C

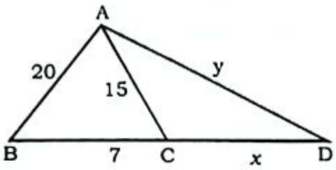
∵ ΔPQR ~ ΔABC
⇒ ∠B = ∠Q
⇒ ∠A + ∠B + ∠C = 180°
⇒ ∠B = 180° − 85° − 58° = 37°
∴ ∠Q = 37°

196. (b)



Given, ΔPST ~ ΔPRQ
and ∠PQR = 47°
⇒ ∠PTS = ∠PQR = 47°
∴ ∠STR = 180° − 47° = 133°

197. (a)



ΔDAB ~ ΔDCA

$\frac{AB}{AC} = \frac{BD}{AD} = \frac{AD}{CD} \Rightarrow \frac{20}{15} = \frac{7+x}{y} = \frac{y}{x}$

$\Rightarrow 4y = 21 + 3x$ ... (i)

and $\frac{x}{y} = \frac{3}{4} \Rightarrow y = \frac{4x}{3}$ ...(ii)

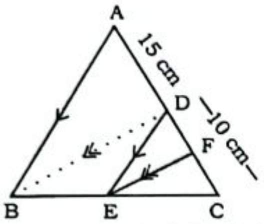
Using eq. (ii) in (i)

$\Rightarrow 4 \times \frac{4x}{3} = 3x + 21$

$\Rightarrow 16x = 9x + 63 \Rightarrow 7x = 63$

$\Rightarrow$ CD (x) = 9cm

198. (c)



ΔCEF ~ ΔCBD (∵ EF ∥ BD)

$\Rightarrow \frac{CE}{BC} = \frac{CF}{CD}$ ....(i)

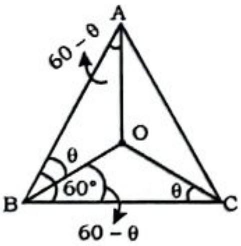
Also, ΔCED ~ ΔCBA (∵ DE ∥ AB)

$\Rightarrow \frac{CE}{BC} = \frac{CD}{CA}$ ....(ii)

From (i) and (ii)

$\frac{CF}{CD} = \frac{CD}{CA} \Rightarrow CF = \frac{CD^2}{CA} = \frac{100}{25} = 4$

199. (a)



$\angle AOB = \angle BOC = \angle COA = \frac{360°}{3}$

$= 120°$

In ΔAOB and ΔBOC

$\angle OAB = \angle OBC \Rightarrow \angle OBA = \angle OCB$

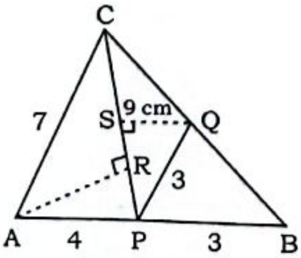
$\angle O = \angle O$

ΔAOB ~ ΔBOC (by AAA)

$\Rightarrow \frac{AO}{BO} = \frac{OB}{OC} \Rightarrow \frac{12}{BO} = \frac{BO}{9}$

$\Rightarrow BO^2 = 108 \Rightarrow BO = 6\sqrt{3}$ cm

200. (c)



In ΔACR and ΔQPS

∠ARC = ∠PSQ (each 90°)

∠ACP = ∠SPQ (Alternate angle)

So, ΔACR ~ ΔQPS

$\Rightarrow \frac{PQ}{AC} = \frac{SQ}{AR} \Rightarrow \frac{3}{7} = \frac{9}{AR}$

$\Rightarrow AR = \frac{9 \times 7}{3} = 21$ cm

201. (d) Sides of ΔABC ⇒

$$\begin{array}{ccccc} 3 & : & 4 & : & 5 \\ \downarrow & & \downarrow & & \downarrow \\ 15 & & 20 & & 25 \end{array}$$

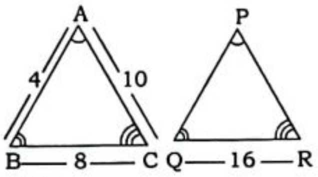
ΔABC and ΔDEF are similar.

$\Rightarrow \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{AC^2}{DF^2}$

$\Rightarrow \frac{2}{1} = \frac{25^2}{DF^2} \Rightarrow 2 = \frac{625}{DF^2}$

$\Rightarrow DF = \frac{25}{\sqrt{2}}$

202. (b)



In ΔABC,

Semi–perimeter of ΔABC (s)

$= \frac{4+8+10}{2} = 11$

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{11 \times 3 \times 1 \times 7} = \sqrt{231}$ cm²

ΔABC ~ ΔPQR

$\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta PQR} = \frac{BC^2}{QR^2} = \frac{8^2}{16^2} = \frac{1}{4}$

1 unit → $\sqrt{231}$ cm²

4 unit → $4\sqrt{231}$ cm²

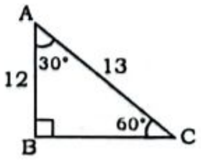
203. (d) By option, (5, 12, 13) is a triplet i.e $12^2 + 5^2 = 13^2$

Hence, sides of right angle triangle.

204. (d) 12cm, 16cm, 20cm, are the sides of right angled triangles

$$\text{Triplet} \rightarrow \begin{array}{ccccc} 3 & : & 4 & : & 5 \\ \downarrow{\scriptstyle \times 4} & & \downarrow{\scriptstyle \times 4} & & \downarrow{\scriptstyle \times 4} \\ 12 & & 16 & & 20 \end{array}$$

205. (b)



BC = $\sqrt{13^2 - 12^2} = \sqrt{25} = 5$ cm

206. (a) Given sides,

$x^2 - 1,\ 2x,\ x^2 + 1$

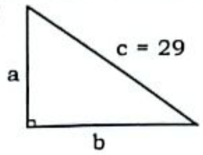
Let, $x = 2$

$2^2 - 1,\ 2 \times 2,\ 2^2 + 1$

3, 4, 5

Hence, hypotenuse = $x^2 + 1$

207. (d)



Given,

c = 29 and a + b = 41

By pythagorean triplet-(20, 21, 29)

and 20 + 21 = 41

a = 20, b = 21

∴ b − a = 21 − 20 = 1

Alternate Method:

$\Rightarrow a^2 + b^2 = 29^2 = 841$ ......(i)

$\Rightarrow a + b = 41$

$\Rightarrow a = 41 - b$

from equation (i)

$\Rightarrow (41 - b)^2 + b^2 = 841$

$\Rightarrow 1681 + b^2 - 82b + b^2 = 841$

$\Rightarrow 2b^2 - 82b + 840 = 0$

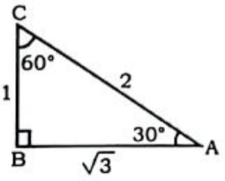
$\Rightarrow b^2 - 41b + 420 = 0$

$\Rightarrow b(b - 21) - 20(b - 21) = 0$

$\Rightarrow b = 20, 21 \Rightarrow b = 21, a = 20$

∴ b − a = 21 − 20 = 1

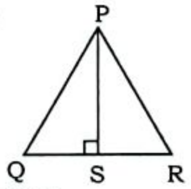
208. (c)



$$\begin{array}{ccccc} AB & : & BC & : & AC \\ \sqrt{3} & : & 1 & : & 2 \\ \times\sqrt{3}\downarrow & & \times\sqrt{3}\downarrow & & \times\sqrt{3}\downarrow \\ 3 & & \boxed{\sqrt{3}} & & \boxed{2\sqrt{3}} \end{array}$$

BC = $\sqrt{3}$ cm, AC = $2\sqrt{3}$ cm

209. (b)



In ΔPSQ,

$PS^2 = PQ^2 - QS^2$ ......(i)

and In ΔPSR,

$PS^2 = PR^2 - SR^2$ ......(ii)

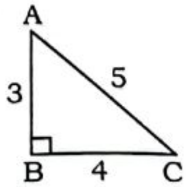
From eqn. (i) and (ii),

$\Rightarrow PQ^2 - QS^2 = PR^2 - SR^2$

$\Rightarrow PQ^2 + SR^2 = PR^2 + QS^2$

$\therefore PR^2 + QS^2 = PQ^2 + SR^2$

210. (d)



∵ Area of Δ = $\frac{1}{2}$ × base × height

∴ Ratio of area

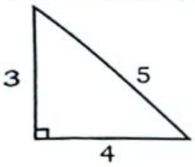
$= \frac{1}{2} \times 3 \times h_1 : \frac{1}{2} \times 4 \times h_2 : \frac{1}{2} \times 5 \times h_3$

$= 3h_1 : 4h_2 : 5h_3$

∵ L.C.M. of 3, 4, 5 = 60

∴ $h_1 : h_2 : h_3 = 20 : 15 : 12$

211. (c) 3 : 4 : 5 is triplet
it means triangle is right angle Δ.



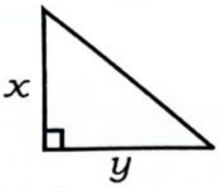
Area of triangle = $\frac{1}{2}$ × base × height

$\Rightarrow \frac{1}{2} \times 3x \times 4x = 486 \Rightarrow 6x^2 = 486$

$\Rightarrow x^2 = 81 \Rightarrow x = 9$

Perimeter of Δ = $3x + 4x + 5x = 12x$
= 12 × 9 = 108 cm.

212. (a)

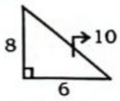


$x - y = 2$

Area of triangle = $\frac{1}{2} \times x \times y$

$\Rightarrow 24 = \frac{1}{2} \times x \times y$

$xy = 48$
8 6
diff 2

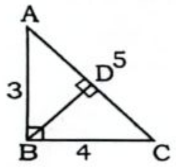


3, 4, 5, → Triplet
×2 ×2 ×2
6 8 10

Perimeter of triangle = 8 + 6 + 10 = 24

213. (d) Perimeter = length of external boundaries = 13 + 12 + 5 = 30 cm

214. (a)



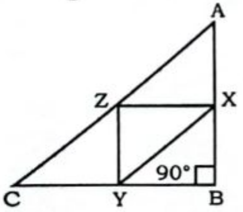
Area of right angle triangle = $\frac{1}{2}$ × base × height

ATQ,

$\frac{1}{2} \times 3 \times 4 = \frac{1}{2} \times 5 \times BD$

$\Rightarrow BD = \frac{12}{5} = 2.4$ cm

215. (b)



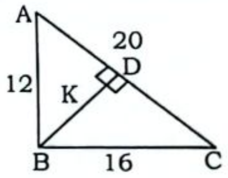
∵ (20, 21 and 29) is a triplets

Area of ΔXYZ = $\frac{1}{4}$ × area of ΔABC

$= \frac{1}{4} \times \frac{1}{2} \times 20 \times 21$

$= \frac{210}{4} = \frac{105}{2} = 52\frac{1}{2}$ cm²

216. (b)



Area of right angle triangle = $\frac{1}{2}$ × Base × Perpendicular

ATQ,

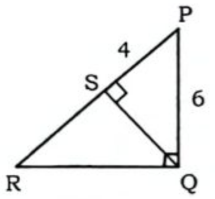
$\frac{1}{2} \times 16 \times 12 = \frac{1}{2} \times 20 \times K$

$\Rightarrow K = \frac{192}{20} = 9.6$ cm

Alternate Method:-

$K = \frac{AB \times BC}{AC} = \frac{12 \times 16}{20} = 9.6$ cm

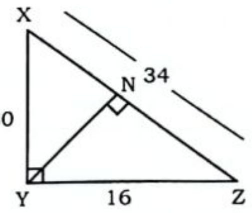
217. (a)



In ⊾PSQ, QS = $\sqrt{PQ^2 - PS^2}$

$= \sqrt{36 - 16} = \sqrt{20} = 2\sqrt{5}$ cm

218. (d)



Using triplet = (8, 15, 17)
YZ = 16 cm
In ⊾XYZ,

Area of ΔXYZ = $\frac{1}{2} \times 30 \times 16$

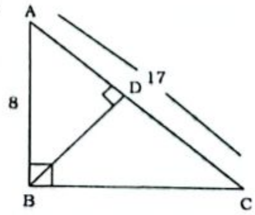
$= \frac{1}{2} \times YN \times 34$

$\Rightarrow YN = \frac{240}{17}$ cm

Alternate Method:

$YN = \frac{XY \times YZ}{XZ} = \frac{30 \times 16}{34} = \frac{240}{17}$ cm

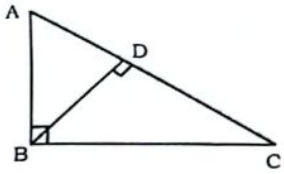
219. (c)



ΔADB ~ ΔABC

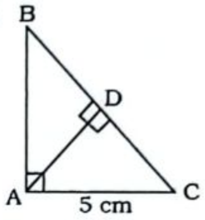
$\Rightarrow \frac{AD}{AB} = \frac{AB}{AC} \Rightarrow AD = \frac{AB^2}{AC} = \frac{8 \times 8}{17}$
= 3.76 cm

220. (d)



We know, $BD^2 = AD \times DC$

221. (b)



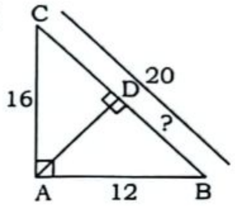
ΔBAC ~ ΔADC

$\frac{\text{Area of } \Delta BAC}{\text{Area of } \Delta ADC} = \frac{BC^2}{AC^2}$

$\Rightarrow \frac{63}{7} = \frac{BC^2}{5^2} \Rightarrow BC^2 = 225$ cm

⇒ BC = 15 cm

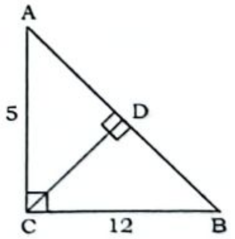
222. (c)



Given,
AB = 12 cm
AC = 16 cm
BC = 20 (By triplet 12, 16, 20)
We know that,

$BD = \frac{AB^2}{BC} = \frac{12 \times 12}{20} = 7.2$ cm.

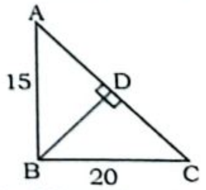
223. (a)



By triplet of 5, 12, 13
AB = 13 cm

$CD = \frac{AC \times BC}{AB} = \frac{5 \times 12}{13} = \frac{60}{13}$ cm

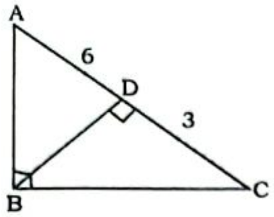
224. (b)



AC = 25 cm (By triplet of 3, 4, 5)

$BD = \frac{AB \times BC}{AC} = \frac{15 \times 20}{25} = 12$ cm

225. (d)

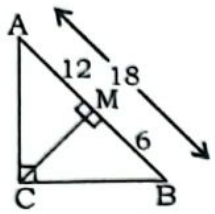


AC = 9, CD = 3

We know, $AB^2 = AD \times AC$

$\Rightarrow AB^2 = 6 \times 9 \Rightarrow AB = 3\sqrt{6}$

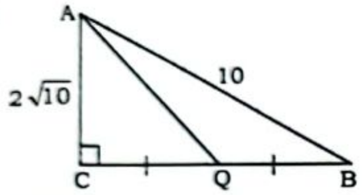
226. (a)



$\because CM^2 = AM \times BM$

$\Rightarrow CM = \sqrt{12 \times 6} = 6\sqrt{2}$

227. (a)



In ΔABC,

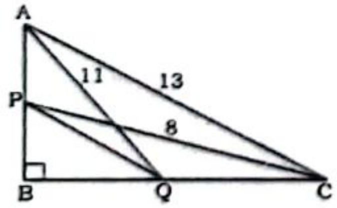
$BC = \sqrt{10^2 - (2\sqrt{10})^2} = \sqrt{60} = 2\sqrt{15}$

Now, $QC = QB = \frac{2\sqrt{15}}{2} = \sqrt{15}$

In ΔACQ,

$AQ = \sqrt{CQ^2 + AC^2} = \sqrt{15+40} = \sqrt{55}$

228. (d)



We know,

$AB^2 + BQ^2 = 121$ ....(i)

$PB^2 + BC^2 = 64$ ....(ii)

and $AB^2 + BC^2 = 169$ .....(iii)

(i) + (ii) − (iii)

$\Rightarrow PB^2 + BQ^2 = 185 - 169$

$\Rightarrow PQ^2 = 16 \Rightarrow PQ = 4$

Alternate Method:

We know that,

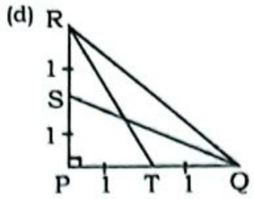
$AQ^2 + PC^2 = PQ^2 + AC^2$

$\Rightarrow 11^2 + 8^2 = PQ^2 + 13^2$

$\Rightarrow 121 + 64 = PQ^2 + 169$

$\Rightarrow PQ = 4$

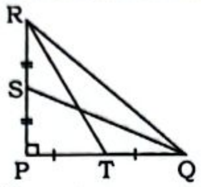
229. (d)



Since S & T are mid points of side PR & PQ.
Let, PQ = PR = 2 unit
In ΔPQR,
$RQ^2 = 8$ unit
In ΔPQS,
$QS^2 = 1^2 + 2^2 = 5$
In ΔPRT,
$RT^2 = 2^2 + 1^2 = 5$

$$\frac{RQ^2}{QS^2 + RT^2} = \frac{8}{5+5} = \frac{8}{10} = \frac{4}{5}$$

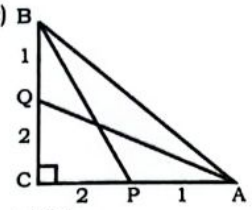
Alternate Method:



Property:-
$4[(QS)^2 + (RT)^2] = 5(RQ)^2$

$$\Rightarrow \frac{RQ^2}{QS^2 + RT^2} = \frac{4}{5}$$

230. (c)



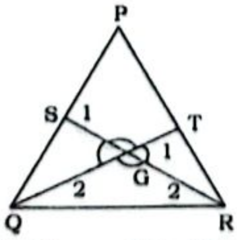
In ΔACB
$AB^2 = BC^2 + AC^2$
$\Rightarrow AB^2 = 3^2 + 3^2$
$\Rightarrow AB = 3\sqrt{2}$

$AQ = \sqrt{AC^2 + QC^2} = \sqrt{13}$

$BP = \sqrt{13}$

$$\therefore \frac{AQ^2 + BP^2}{AB^2} = \frac{13+13}{18} = \frac{13}{9}$$

231. (b)



QT = 18 cm, RS = 27 cm

$QG = 18 \times \frac{2}{3} = 12$ cm

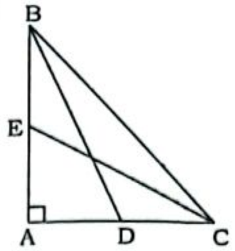
RS = 27 cm

$SG = 27 \times \frac{1}{3} = 9$ cm

From Pythagoras theorem in ⊾SQG,

$\therefore QS = \sqrt{12^2 + 9^2} = \sqrt{144 + 81} = \sqrt{225}$
= 15 cm

232. (d)



We know,

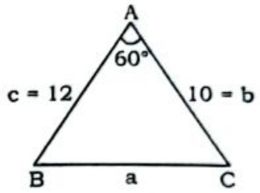
$$CE^2 + BD^2 = \frac{5}{4} BC^2$$

$$\Rightarrow \left(\frac{5\sqrt{13}}{2}\right)^2 + (BD)^2 = \frac{5}{4}(10)^2$$

$$\Rightarrow BD = \sqrt{125 - \frac{325}{4}}$$

$$= \sqrt{\frac{175}{4}} = \frac{5}{2}\sqrt{7}$$

233. (d)

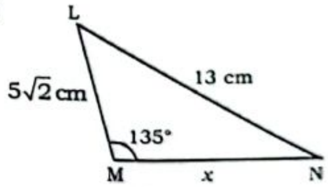


By cosine rule, $a^2 = b^2 + c^2 - 2bc\cos A$
$\Rightarrow a^2 = 100 + 144 - 2 \times 120 \times \cos 60^\circ$

$\Rightarrow a^2 = 244 - 240 \times \frac{1}{2} \Rightarrow a^2 = 124$

$\Rightarrow a = \sqrt{124} \sim 11.13$ cm.

234. (a)



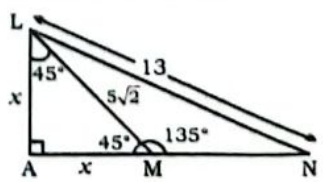
$$\cos 135^\circ = \frac{(5\sqrt{2})^2 + x^2 - 13^2}{2 \times 5\sqrt{2} \times x}$$

$$\cos(90^\circ + 45^\circ) = \frac{50 + x^2 - 169}{10\sqrt{2}\,x}$$

$$\sin 45^\circ = \frac{x^2 - 119}{10\sqrt{2}\,x}$$

$\Rightarrow x^2 - 10x - 119 = 0$
$\Rightarrow x = 7, -17 \Rightarrow x = 7$
∴ MN = 7 cm

Alternate Method:

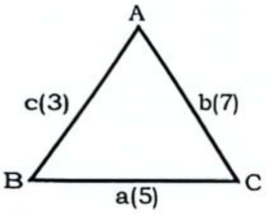


Draw LA ⊥ AN, when NM is Extended
∠LMA = 180° − 135° = 45°
∠ALM = ∠LMA = 45°
⇒ LA = AM = x
By pythagoras theorem

$x^2 + x^2 = (5\sqrt{2})^2 \Rightarrow 2x^2 = 50 \Rightarrow x = 5$

With the help of triplet 5, 12, 13
AN = 12 cm.
∴ MN = 12 − 5 = 7 cm

235. (a)



Applying cosine formula,

$$\cos B = \frac{a^2+c^2-b^2}{2ac}$$

$$\Rightarrow \cos B = \frac{(5^2+3^2-7^2)}{2\times5\times3}$$

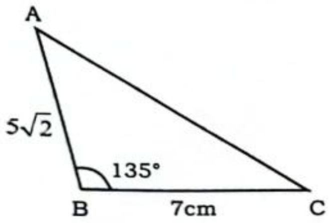
$$\Rightarrow \cos B = \frac{(25+9-49)}{30}$$

$$\Rightarrow \cos B = \frac{-15}{30} = -\frac{1}{2}$$

$$\Rightarrow \cos B = \cos 120^0$$

$$\therefore B = 120°$$

236. (d)



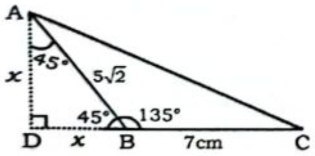
Using cosine rule,

$$\cos 135° = \frac{(5\sqrt2)^2+(7)^2-(AC)^2}{2\times5\sqrt2\times7}$$

$$\Rightarrow \frac{-1}{\sqrt2} = \frac{99-AC^2}{70\sqrt2}$$

$\Rightarrow AC^2 = 169 \Rightarrow AC = 13$ cm

Alternate Method:



Extended CB to D, AD ⊥ DC

$\angle A = \angle B = 45° \Rightarrow AD = DB = x$

$x^2 + x^2 = (5\sqrt2)^2$

(By pythagoras theorem)

$\Rightarrow 2x^2 = 50 \quad \Rightarrow x = 5$

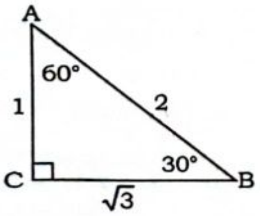
$\therefore$ DC = 5 + 7 = 12 cm

with the help of triplet 5, 12 and 13, AC = 13 cm.

237. (d) Ratio of angles = 1 : 2 : 3

6 unit = 180°

1 unit = 30°



Ratio of sides = 1 : $\sqrt3$: 2

Alternate Method:

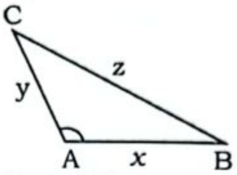
$$\left[\begin{array}{l}\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}\\ a : b : c = \sin A : \sin B : \sin C\end{array}\right]$$

a : b : c = sin30° : sin60° : sin90°

$$= \frac{1}{2} : \frac{\sqrt3}{2} : 1 = 1 : \sqrt3 : 2$$

238. (a) Triangle PQR will be obtuse angle triangle.

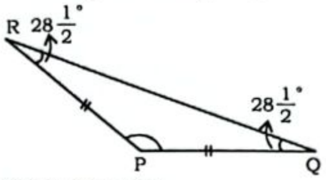
239. (c)



We know that,

In acute angle Δ- $x^2 + y^2 > z^2$

240. (d)



In ΔRPQ, PR = PQ

$$\angle P = 180° - 2 \times 28\frac{1}{2}° = 123°$$

241. (a) In a scalene triangle :-

all angle are different and sum of all angle is 180°

60°, 30°, 90° are angle of a scalene Δ.

242. (d) Condition to make a triangle,

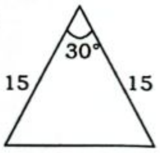
$|AB + BC| > x > |AB - AC|$

$\Rightarrow |3.8 + 6| > x > |3.8 - 6|$

$\Rightarrow 9.8 > x > 2.2$

So, 2.2 is not side of triangle.

243. (c)

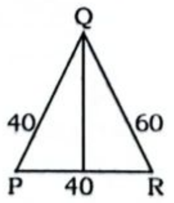


$$\text{Area of } \Delta = \frac{1}{2}ab.\sin30°$$

$$= \frac{1}{2} \times 15 \times 15 \sin30°$$

$$= \frac{1}{2} \times 225 \times \frac{1}{2} = \frac{225}{4} = 56.25 \text{ cm}^2$$

244. (b)



$$\text{Semi-perimeter (s)} = \frac{40+40+60}{2} = 70$$

Area of ΔPQR

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

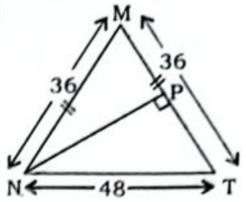
$$= \sqrt{70\times30\times30\times10} = 300\sqrt7 \text{ cm}^2$$

ATQ,

$$300\sqrt7 = \frac{1}{2} \times 40 \times \text{height}$$

$\Rightarrow$ height = $15\sqrt7$ cm

245. (a)



Semi-perimeter (s)

$$= \frac{36+36+48}{2} = 60 \text{ cm}$$

$$\text{Area of } \Delta MNT = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{60\times24\times24\times12}$$

$$= 24 \times 12 \times \sqrt5 \text{ cm}^2$$

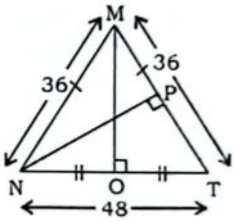
ATQ,

$$24 \times 12 \times \sqrt5 = \frac{1}{2} \times MT \times NP$$

$$\Rightarrow 24 \times 12 \times \sqrt5 = \frac{1}{2} \times 36 \times NP$$

$\Rightarrow NP = 16\sqrt5$ cm

Alternate Method:



ΔMNT is isosceles triangle.

$\Rightarrow$ NO = OT = 24 cm

$$MO = \sqrt{MN^2 - NO^2} = \sqrt{36^2 - 24^2}$$

$$= \sqrt{60\times12} = 12\sqrt5 \text{ cm}$$

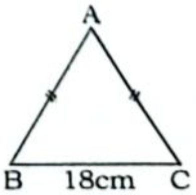
ATQ,

$$\frac{1}{2} \times MO \times NT = \frac{1}{2} \times MT \times NP$$

$\Rightarrow 12\sqrt5 \times 48 = 36 \times NP$

$\Rightarrow NP = 16\sqrt5$ cm.

246. (c)



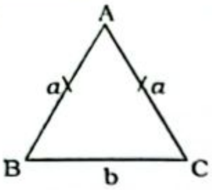
BC = 18 cm (Given)

Perimeter = 50 cm

Since ΔABC is isosceles triangle,

$$AB = AC = \frac{50-18}{2} = \frac{32}{2} = 16\text{cm}$$

247. (c)



a + a > b

If a = 6 then, b = 12

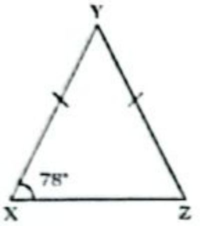
then, 6 + 6 = 12 (Not possible)

If a = 12, then b = 6

12 + 12 > 6 (Possible)

∴ Length of third side of Δ = 12 cm.

248. (b)

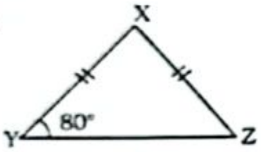


XY = YZ

$\Rightarrow \angle X = \angle Z = 78°$

$\angle Y = 180° - 78° - 78° = 24°$

249. (c)



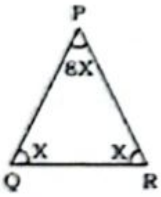
In ΔXYZ,

XY = XZ (Given)

So, $\angle Y = \angle Z = 80°$

$\therefore \angle X = 180° - (80° + 80°) = 20°$

250. (d)



In ΔPQR,

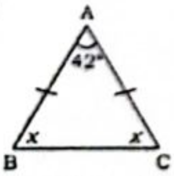
$8X + X + X = 180° \Rightarrow X = 18°$

$\therefore \angle P = 8 \times 18° = 144°$

∴ Square root of vertex angle

$= \sqrt{144°} = 12°$

251. (b)



$\angle A = 42°$ (Given)

AB = BC (equal side of Δ)

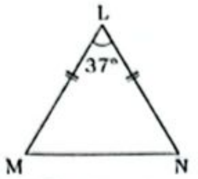
$\angle C = \angle B$

$42° + x + x = 180°$ (Sum of angle of triangle)

$\Rightarrow 2x = 138° \Rightarrow x = 69°$

So,69° and 69° are two angles of triangles

252. (d)



$\angle L = 37°$, (Given)

∴ ΔLMN is isosceles triangle

LM = LN

$\angle N = \angle M$ (if the sides of a triangle are equal, then the angle opposite to it will also be equal)

Sum of angle of a triangle = 180°

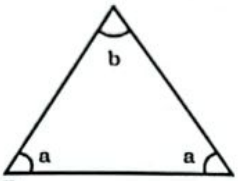
$\Rightarrow \angle L + \angle M + \angle N = 180°$

$\Rightarrow 37° + \angle M + \angle N = 180°$

$\Rightarrow \angle M + \angle N = 180° - 37° = 143°$

Then $\angle M = \angle N = \frac{143°}{2} = 71.5°$

253. (c)



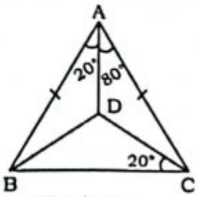
ATQ,

$b = 5(a + a) \Rightarrow b = 10a$

Also, $2a + b = 180°$

$\Rightarrow 12a = 180° \Rightarrow a = 15°$

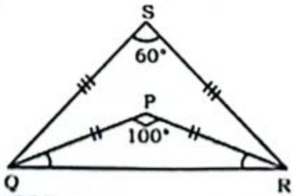
254. (d)



AB = AC (given)

$\angle ABC = \angle ACB = \frac{180° - 100°}{2} = 40°$

255. (d)



In ΔPQR,

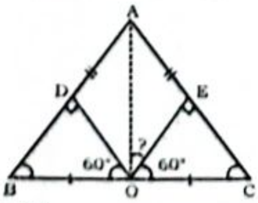
$\angle PQR = \angle PRQ = 40°$

Also, In ΔSQR,

$\angle SQR = \angle SRQ = 60°$

$\therefore \angle SRP = 60° - 40° = 20°$

256. (c)



AB = AC

$\Rightarrow \angle ABC = \angle ACB = x$ (say)

In ΔODB & ΔOEC, $\angle D = \angle E$

$\angle B = \angle C$

$\Rightarrow \angle BOD = \angle EOC = 60°$ (Given)

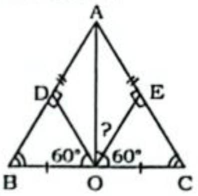
Since, ΔABC is an isosceles triangle.

⇒ AO is the perpendicular bisector

$\therefore \angle AOC = 90°$

$\Rightarrow \angle AOE = 90° - 60° = 30°$

Alternate Method:



In ΔDBO,

$\angle B = 30°$

$\angle B = \angle C = 30°$ ($\because$ AB = AC)

In ΔEOC,

$\angle EOC = 60°$

In ΔAOD and ΔAOE

AE = AD

$\angle ADO = \angle AEO = 90°$

AO = AO (common)

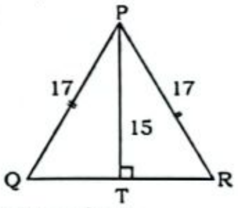
$\therefore \Delta AOD \cong \Delta AOE$ (RHS)

$\angle AOD = \angle AOE$

$= \frac{180° - 120°}{2} = \frac{60°}{2} = 30°$

Hence, $\angle AOE = 30°$

257. (c)



In an isosceles Δ,

Altitude = Median

⇒ QT = TR

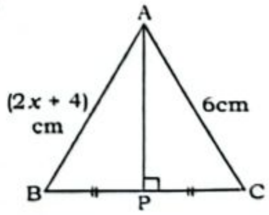
We know the triplet

(8, 15, 17)

⇒ QT = TR = 8

∴ QR = 2 × 8 = 16 cm

258. (a)



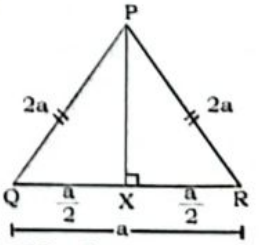
∵ AP ⊥ BC and AP is median of BC.

∴ ΔABC is isosceles Δ.

So, AB = AC

$\therefore 2x + 4 = 6 \Rightarrow 2x = 2 \Rightarrow x = 1$

259. (d)



PQ = PR = 2a

In isosceles triangle,

Median = Perpendicular bisector

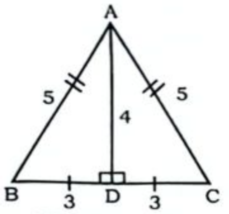
$\Rightarrow QX = \frac{a}{2}$

By Pythagoras theorem in ΔPXQ

$\Rightarrow PX^2 = 4a^2 - \frac{a^2}{4} \Rightarrow PX^2 = \frac{15a^2}{4}$

$\Rightarrow PX = \frac{a\sqrt{15}}{2}$

260. (b)



AC = AB = 5

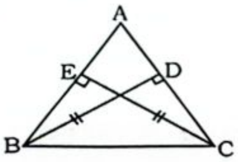
AD = Median, also perpendicular bisector of side BC

In ◺ADB,

Then, BD = $\sqrt{5^2 - 4^2}$ = 3 = DC

∴ BC = BD + CD = (3 + 3) = 6

261. (a)



Area of ΔABC = Area of ΔABC

$\Rightarrow \frac{1}{2} \times AB \times CE = \frac{1}{2} \times AC \times BD$

⇒ AB = AC

Hence, isosceles triangle.

Alternate Method:-

Consider, ΔBDC, ΔCEB:-

∠BEC = ∠BDC = 90°

EC = BD (given)

BC = CB (common)

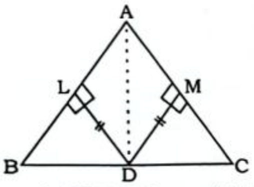
⇒ ΔBDC ≅ ΔCEB

⇒ ∠EBC = ∠DCB

⇒ AB = AC

Hence, isosceles triangle.

262. (a)



Area of ΔABD = Area of ΔADC

$\Rightarrow \frac{1}{2} \times DL \times AB = \frac{1}{2} \times DM \times AC$

⇒ AB = AC (DL = DM given)

∴ ΔABC is an isosceles triangle.

Alternate Method:

In ΔABD and ΔADC,

area of ΔABD = ΔACD (Because AD is dividing BC into 2 equal parts)

DL = DM = h

Both triangles have same area and same height then Base of both triangles will be same.

⇒ AB = AC = Base

∴ ΔABC is an isosceles triangle.

263. (a) If the median of a triangle are equal then the triangle will be equilateral triangle.

264. (d) All the sides of equilateral triangle is same.

sum of two sides (2a) = 16

⇒ a = 8

∴ Third side = 8 cm

265. (b) Area of equilateral triangle

$= \frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4} \times 16 \times 16 = 64\sqrt{3}\text{ cm}^2$

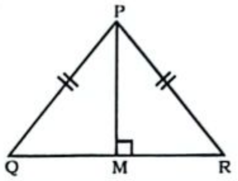
266. (a) Area of equilateral triangle

$= \frac{\sqrt{3}}{4}a^2 \Rightarrow \frac{\sqrt{3}}{4}a^2 = 289\sqrt{3}\text{ cm}^2$

$\Rightarrow a^2 = 289 \times 4 \Rightarrow a^2 = \sqrt{289 \times 4}$

⇒ a = 17 × 2 = 34 cm

267. (b)



Let, PQ = QR = PR = 4 cm

In ΔPMR

PM = $\sqrt{4^2 - 2^2} = 2\sqrt{3}$

Then check by options. Option (b) satisfies

⇒ 3PQ² = 4PM²

⇒ 3 × 16 = 4 × 4 × 3 ⇒ 48 = 48

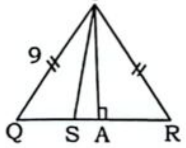
Alternate Method:

We know, PQR is an equilateral triangle

$\Rightarrow PM = \frac{\sqrt{3}}{2}\ PQ$

On squaring ⇒ 4PM² = 3PQ²

268. (a)



Let, In ΔPQR, PA ⊥ QR

$PA = \frac{\sqrt{3}}{2} \times 9 = \frac{9\sqrt{3}}{2}$

$QS = \frac{9}{3} = 3$

QA = AR = 4.5 (∴ PA is also median)

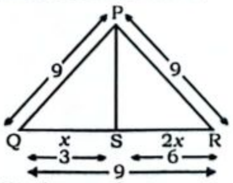
AS = 4.5 – 3 = 1.5

∴ PS = $\sqrt{PA^2 + AS^2}$

$= \sqrt{\left(\frac{9\sqrt{3}}{2}\right)^2 + \left(\frac{3}{2}\right)^2} = \sqrt{\frac{243}{4} + \frac{9}{4}}$

$= \sqrt{\frac{252}{4}} = \sqrt{63}$

Alternate Method:



We know that,

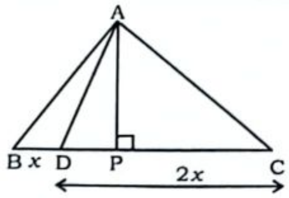
PS² = PQ × PR – QS × SR

⇒ PS² = 9 × 9 – 3 × 6

⇒ PS² = 81 – 18

⇒ PS² = 63 ⇒ PS = $\sqrt{63}$ cm

269. (d)



AP ⊥ BC

$\Rightarrow BP = PC = \frac{3}{2}x\ [\because BC = 3x]$

$\Rightarrow DP = \frac{1}{2}x$

In ΔAPD, AD² = AP² + DP²

$\Rightarrow AP^2 = 175 - \frac{x^2}{4}$ ....(i)

InΔAPC,

AP² = AC² – PC²

$= (3x)^2 - \left(\frac{3}{2}x\right)^2$

$= 9x^2 - \frac{9}{4}x^2 = \frac{27}{4}x^2$ ....(ii)

Put (ii) in (i)

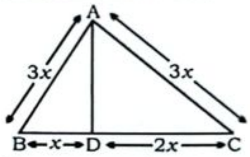
$\frac{27}{4}x^2 + \frac{1}{4}x^2 = 175$

$\Rightarrow \frac{28}{4}x^2 = 175$

⇒ x = 5

∴ Side = 3x = 3 × 5 = 15 cm

Alternate Method:



By stewart's theorem,

AD² = AB × AC – BD × DC

⇒ 25 × 7 = 9x^2 – 2x^2

⇒ 7x^2 = 25 × 7

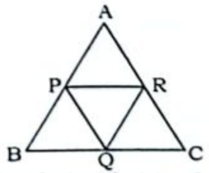
⇒ x = 5

∴ Side = 3x = 3 × 5 = 15 cm

270. (d) Side of equilateral triangle (a) = 16

$\therefore \frac{\text{Perimeter}}{\text{Sum of median}} = \frac{3a}{3 \times \frac{\sqrt{3}}{2}a} = \frac{2}{\sqrt{3}}$

271. (b)



Side of triangle (a) = 8 cm

Area of equilateral ΔABC = $\frac{\sqrt{3}}{4} \times a^2$

$= \frac{\sqrt{3}}{4} \times 8 \times 8 = 16\sqrt{3}$

As we know, If P,Q and R are the mid points of sides AB, BC and CA, then

Area of ΔPQR = $\frac{1}{4}$ × Area of ΔABC

$= \frac{1}{4} \times 16\sqrt{3} = 4\sqrt{3}$

272. (a) Let, the side of Δ Z is x

Side → $6 : 8 : x$

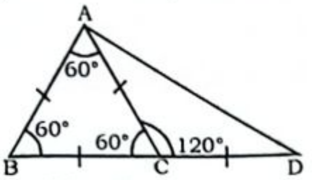
Area → $36 : 64 : x^2$

ATQ,

$\Rightarrow 36 + 64 = x^2$

$\Rightarrow x^2 = 100 \Rightarrow x = 10$

273. (a) ΔABC is an equilateral triangle



AB = BC = AC

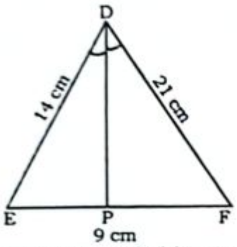
$\because$ CD = BC (Given)

So, $\angle CAD = \angle CDA$

($\because$ ΔACD is isosceles Δ)

$\therefore \angle CAD = \frac{180° - 120°}{2} = 30°$

274. (a)



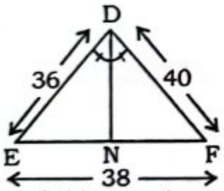
By internal angle bisector theorem

$\frac{DE}{DF} = \frac{EP}{PF} \Rightarrow \frac{14}{21} = \frac{EP}{PF} \Rightarrow \frac{EP}{PF} = \frac{2}{3}$

EF = 9 (Given)

$EP = \frac{2}{2+3} \times 9 = \frac{2}{5} \times 9 = 3.6$ cm

275. (b)



By angle bisector theorem,

$\frac{DE}{DF} = \frac{EN}{NF}$

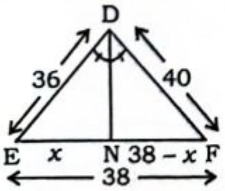
$\Rightarrow \frac{EN}{NF} = \frac{36}{40} = \frac{9}{10}$

19 unit → 38

⇒ 1 unit → 2

$\therefore$ NF = 10 unit = 10 × 2 = 20

Alternate Method:



By angle bisector theorem,

$\frac{DE}{DF} = \frac{EN}{NF}$

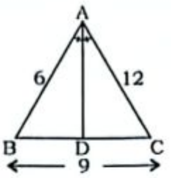
$\Rightarrow \frac{36}{40} = \frac{x}{38 - x}$

$\Rightarrow 36 \times 38 - 36x = 40x$

$\Rightarrow 76x = 36 \times 38 \Rightarrow x = 18$

$\therefore NF = 38 - x = 38 - 18 = 20$

276. (b)



By internal angle bisector theorem,

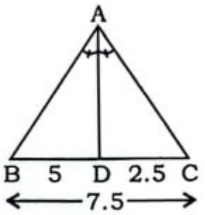
$\frac{AB}{AC} = \frac{BD}{DC}$

$\Rightarrow \frac{6}{12} = \frac{BD}{DC} \Rightarrow \frac{1}{2} = \frac{BD}{DC}$

$\Rightarrow DC = 9 \times \frac{2}{3} = 6$ cm.

Hence, Length of DC = 6 cm.

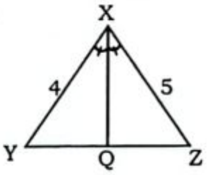
277. (d)



By internal angle bisector theorem,

$\frac{AB}{AC} = \frac{BD}{CD} \Rightarrow \frac{AB}{AC} = \frac{5}{2.5} = 2 : 1$

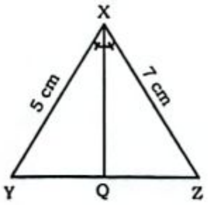
278. (d)



By internal angle bisector theorem,

$\frac{YQ}{QZ} = \frac{XY}{XZ} = \frac{4}{5}$

279. (d)

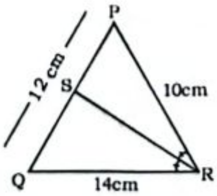


By internal angle bisector theorem

If XQ is angle bisector of $\angle X$

then $\frac{XY}{XZ} = \frac{YQ}{QZ} = \frac{5}{7}$

280. (c)



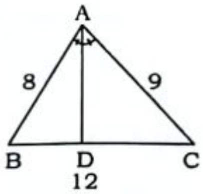
By angle bisector theorem,

$\frac{RP}{RQ} = \frac{PS}{QS}$

$\Rightarrow$ PS : SQ = 10 : 14 = 5 : 7

$\therefore SQ = \frac{7}{5+7} \times 12 = 7$ cm

281. (a)



Let, BD = x, DC = $12 - x$

By angle bisector theorems

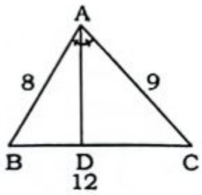
$\frac{AB}{AC} = \frac{BD}{DC} \Rightarrow \frac{8}{9} = \frac{x}{12 - x}$

$\Rightarrow 96 - 8x = 9x \Rightarrow 96 = 17x$

$\Rightarrow x = \frac{96}{17} = 5\frac{11}{17}$ cm

$\therefore BD = 5\frac{11}{17}$ cm

Alternate Method:



$\therefore$ AD is the angle bisector of $\angle BAC$

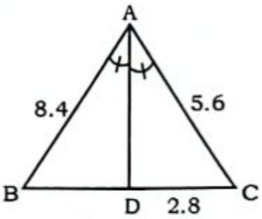
So,

$\frac{AB}{AC} = \frac{BD}{DC}$

BC = 12 [Given]

$\therefore$ Smaller side $= \frac{8}{8+9} \times 12 = 5\frac{11}{17}$ cm

282. (c)



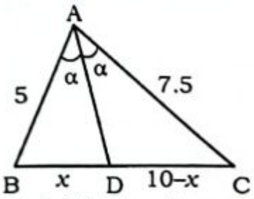
By Angle Bisector theorem,

$\frac{AB}{AC} = \frac{BD}{CD}$

$\Rightarrow \frac{8.4}{5.6} = \frac{BD}{2.8} \Rightarrow BD = 4.2$

$\therefore$ BC = 4.2 + 2.8 = 7 cm.

283. (d)



By angle bisector theorem

$\frac{AB}{AC} = \frac{BD}{DC}$

$\Rightarrow \frac{5}{7.5} = \frac{x}{10 - x}$

$\Rightarrow 20 - 2x = 3x$

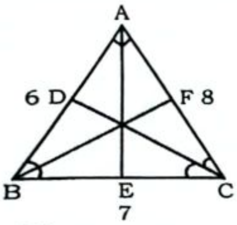
$\Rightarrow 5x = 20 \Rightarrow x = 4$

$\Rightarrow$ BD = 4 & DC = 6

mid point of BC $= \frac{10}{2} = 5$

$\therefore$ Distance of D from mid point of BC = 5 – 4 = 1 cm

284. (d)



Let, BE = x

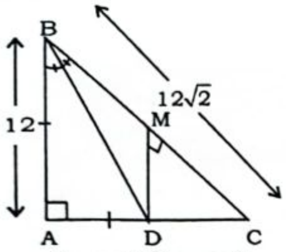
By angle bisector theorem,

$\frac{AB}{AC} = \frac{BE}{EC} \Rightarrow \frac{6}{8} = \frac{x}{7-x}$

$\Rightarrow 42 = 14x \Rightarrow x = 3$

$\therefore$ BE = 3 cm

285. (c)



By Internal angle bisector theorem,

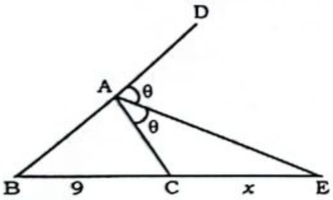
$\frac{AB}{BC} = \frac{AD}{DC} \Rightarrow \frac{12}{12\sqrt{2}} = \frac{AD}{DC}$

$\Rightarrow \frac{1}{\sqrt{2}} = \frac{AD}{DC}$

$(\sqrt{2} + 1)$ units = 12

1 unit = $\frac{12}{\sqrt{2}+1} = 12\left(\sqrt{2}-1\right)$ cm

286. (c)



Let CE = x

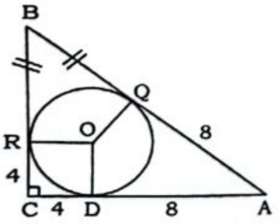
By external angle bisector theorem

$\frac{AB}{AC} = \frac{BE}{CE}$

$\Rightarrow \frac{5}{2} = \frac{9+x}{x} \Rightarrow x = 6$

$\therefore$ CE = 6 cm

287. (d)



Let, BR = x

In ΔBCA, $AB^2 = AC^2 + BC^2$

$\Rightarrow (8 + x)^2 = 12^2 + (4 + x)^2$

$\Rightarrow 64 + x^2 + 16x = 144 + 16 + x^2 + 8x$

$\Rightarrow 8x = 160 - 64$

$\Rightarrow 8x = 96$

$\Rightarrow x = 12$ cm

$\therefore$ CB = 12 + 4 = 16 cm

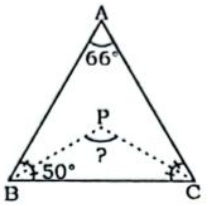
SMART APPROACH:-

With the help of triplets,

$$\begin{array}{ccc} 3 & 4 & 5 \\ \downarrow & \downarrow & \downarrow \\ 12 & 16 & 20 \end{array}$$

CB = 16 cm because it satisfied the given conditions

288. (b)



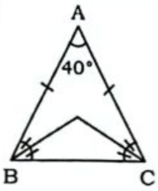
$\angle C = 180° - (66° + 50°) = 180° - 116° = 64°$

$\therefore \angle BPC = 90° + \frac{1}{2} \times 66° = 90° + 33°$

$= 123°$

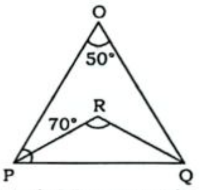
$\therefore \angle BPC - \angle PCA = 123° - 32° = 91°$

289. (d)



$\angle BOC = 90° + \frac{40°}{2} = 90° + 20° = 110°$

290. (d)

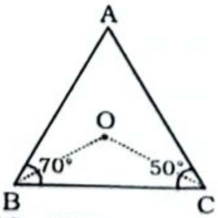


PR and QR are angle bisector of ∠P and ∠Q respectively

We know that, $\angle PRQ = 90° + \frac{1}{2}$

$\angle POQ = 90° + \frac{50°}{2} = 115°$

291. (a)

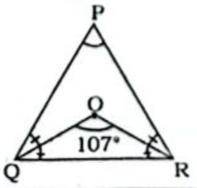


$\angle BAC = 180° - (70° + 50°) = 60°$

$\therefore \angle BOC = 90° + \frac{\angle A}{2}$

$= 90° + \frac{60°}{2} = 120°$

292. (d)

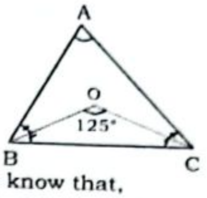


$\angle O = 90° + \frac{\angle P}{2}$

$\Rightarrow 107° = 90° + \frac{\angle P}{2}$

$\Rightarrow \angle P = 34°$

293. (d)



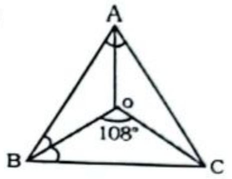
We know that,

$\angle BOC = 90° + \frac{1}{2}\angle BAC$

$\Rightarrow 125° = 90° + \frac{1}{2}\angle BAC$

$\Rightarrow \angle BAC = 70°$

294. (d)

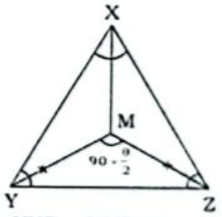


$\angle BOC = 90° + \frac{\angle A}{2}$

$\Rightarrow 108° = 90° + \frac{\angle A}{2} \Rightarrow \frac{\angle A}{2} = 18°$

$\therefore \angle BAO = 18°$

295. (a)



In ΔXYZ, $\angle YXZ = \theta$

So, $\angle YMZ = 90° + \frac{\theta}{2}$

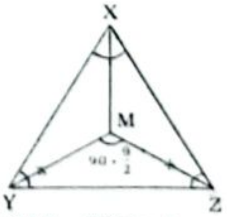
$\because \angle YXZ + \angle YMZ = 150°$

$\Rightarrow \theta + 90° + \frac{\theta}{2} = 150°$

$\Rightarrow \frac{3\theta}{2} = 60° \Rightarrow \theta = 40°$

$\therefore \angle YXZ = 40°$

296. (a)



In ΔXYZ, $\angle YXZ = \theta$

So, $\angle YMZ = 90° + \frac{\theta}{2}$

$\because \angle YXZ + \angle YMZ = 150°$

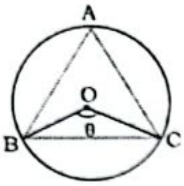
$\Rightarrow \theta + 90° + \frac{\theta}{2} = 150°$

$\Rightarrow \frac{3\theta}{2} = 60° \Rightarrow \theta = 40°$

$\therefore \angle YXZ = 40°$

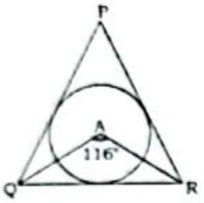
297. (b) The angle formed by any side at the incentre is always 90° more than the angle at the opposite vertex. But the true statement is-

The angle formed by any side at the incentre is always 90° more than the half of the angle at the opposite vertex.



$\theta = 90^\circ + \frac{\angle A}{2}$

298. (b)



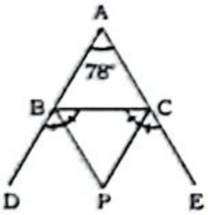
Intersection point of angle bisector of triangle is called incenter.

So,

$\angle QAR = 90^\circ + \frac{\angle QPR}{2}$

$\Rightarrow 116^\circ = 90^\circ + \frac{\angle QPR}{2} \Rightarrow \angle QPR = 52^\circ$

299. (a)

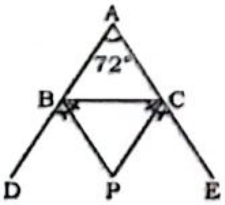


In BP & CP are angle bisector of ∠DBC & ∠ECB

$\angle BPC = 90^\circ - \frac{1}{2}\angle BAC$

$\Rightarrow \angle P = 90^\circ - \frac{1}{2} \times 78^\circ = 51^\circ$

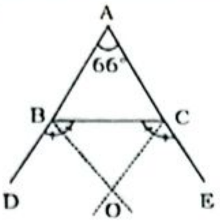
300. (c)



$\angle P = 90^\circ - \frac{\angle A}{2}$

$= 90^\circ - \frac{72^\circ}{2} = 90^\circ - 36^\circ = 54^\circ$

301. (c)

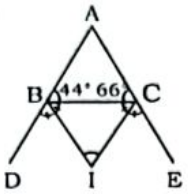


We know that,

$\angle BOC = 90^\circ - \frac{\angle A}{2}$

$= 90^\circ - \frac{66^\circ}{2} = 90^\circ - 33^\circ = 57^\circ$

302. (d)



Given,

∠ABC = 44°

∠ACB = 66°

∠BAC = 180° – (44° + 66°) = 70°

We know that-

If BI and CI are angle bisector of ∠CBD and ∠BCE then

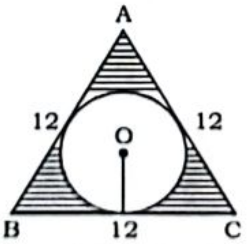
$\angle BIC = 90^\circ - \frac{\angle A}{2}$

$= 90^\circ - \frac{70^\circ}{2} = 55^\circ$

303. (a) Side of triangle = 12 cm

Inradius of an equilateral triangle

$(r) = \frac{\text{Side}}{2\sqrt{3}} = \frac{12}{2\sqrt{3}} = 2\sqrt{3}$



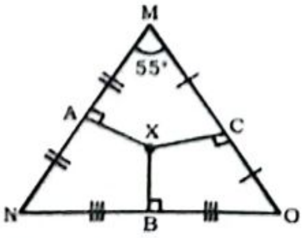
Area of shaded region

$= \frac{\sqrt{3}}{4} \times 12^2 - \frac{22}{7} \times (2\sqrt{3})^2$

$= 36\sqrt{3} - \frac{264}{7} = 36 \times 1.73 - 37.714$

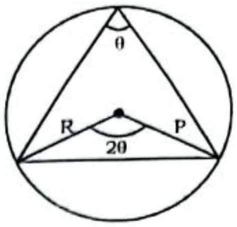
$= 62.352 - 37.714 = 24.64\text{cm}^2$

304. (b)



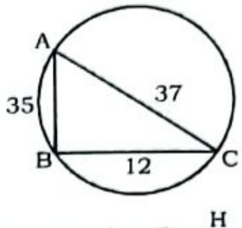
∠NMO = 55° (given)

We know that,



∴ ∠NXO = 55° × 2 = 110°

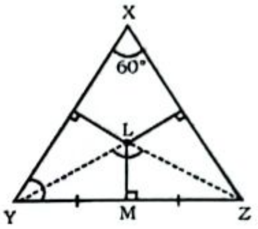
305. (a) 12, 35, 37 follow pythagorean triplet



$\text{Circumradius (R)} = \frac{H}{2} = \frac{37}{2}$

$= 18.5 \text{ cm.}$

306. (a)



∠YXZ = 60°

LM ⊥ YZ (Given)

⇒ ∠YLZ = 2 × ∠YXZ = 120°

In ΔYLM & ΔZLM

YM = MZ

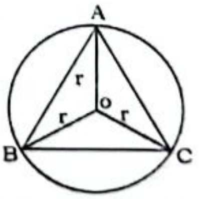
∠YML = ∠LMZ = 90°

LY=LZ (Radius of circumcircle)

⇒ ΔYLM ≅ ΔZLM (By RHS)

$\therefore \angle YLM = \angle ZLM = \frac{120^\circ}{2} = 60^\circ$

307. (c)

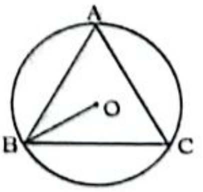


OA = OB = OC = r (radius)

Let side of equilateral triangle = a

$\text{Circumradius (r)} = \frac{a}{\sqrt{3}} \Rightarrow a = \sqrt{3}r$

308. (c)



Given,

$\text{Area} = \frac{\sqrt{3}}{4}a^2 \Rightarrow 36\sqrt{3} = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow a = 12$

We know that, Circumradius (R)

$= \frac{\text{Side}}{\sqrt{3}} = \frac{12}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 4\sqrt{3}$

309. (c) $(2x + 4x + 6x) = 180°$

$\Rightarrow 12x = 180° \Rightarrow x = 15°$

Angles = 30°, 60°, 90°

Given triangle is a right angle triangle.

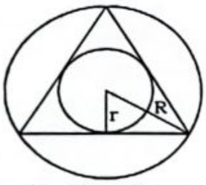
So, Circumradius of right angle triangle $= \frac{\text{Hypotenuse}}{2}$

$\Rightarrow 12 = \frac{\text{Hypotenuse}}{2}$

$\Rightarrow$ Hypotenuse = 24 cm

Note:- No need to find the value of base and perpendicular because in options only in option (c) has hypotenuse value 24 cm.

310. (d)



Length of inradius (r)

$= \frac{a}{2\sqrt{3}} = \frac{18}{2\sqrt{3}} = 3\sqrt{3}$

Length of circumradius (R)

$= \frac{a}{\sqrt{3}} = 6\sqrt{3}$

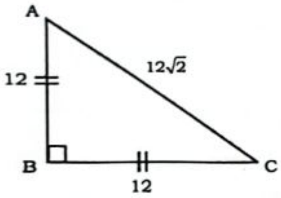
ATQ,

Area of region between circle $= \pi(R^2 - r^2)$

$= \frac{22}{7}(108 - 27)$

$= \frac{22}{7} \times 81 = 254\frac{4}{7}$

311. (b)



In radius $= \frac{P + B - H}{2}$

$= \frac{12 + 12 - 12\sqrt{2}}{2}$

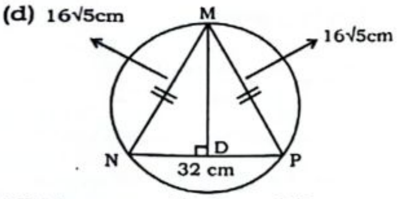
$= \frac{24 - 12\sqrt{2}}{2} = 12 - 6\sqrt{2} = 6(2 - \sqrt{2})$

Circum radius $= \frac{H}{2} = \frac{12\sqrt{2}}{2} = 6\sqrt{2}$

$\therefore$ Required ratio $= \frac{6(2-\sqrt{2})}{6\sqrt{2}}$

$= \frac{2-\sqrt{2}}{\sqrt{2}}$

312. (d)



MD is perpendicular to NP

So, ND = DP $= \frac{32}{2} = 16$ cm

MD $= \sqrt{\left[(16\sqrt{5})^2 - (16)^2\right]}$

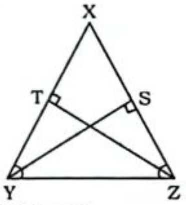
$= \sqrt{(1280 - 256)} = \sqrt{1024} = 32$ cm

Area of $\Delta MNP = \frac{1}{2} \times 32 \times 32 = 512\ \text{cm}^2$

Circumradius $= \frac{abc}{4 \times \text{Area of triangle}}$

$= \frac{16\sqrt{5} \times 16\sqrt{5} \times 32}{4 \times 512} = 20\text{cm}$

313. (a)



$\because$ XY = XZ

$\Rightarrow$ Area of ΔXYZ = Area of ΔXYZ

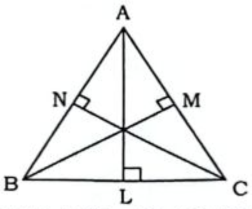
$\Rightarrow \frac{1}{2} \times XY \times ZT = \frac{1}{2} \times XZ \times YS$

$\therefore$ XY = XZ, Then

$\Rightarrow \frac{1}{2} \times XY \times ZT = \frac{1}{2} \times XY \times YS$

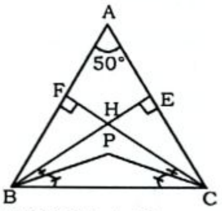
$\Rightarrow$ ZT = YS

314. (d)



AL + BM + CN < AB+ BC + CA

315. (a)



In ΔABC, $BE \perp AC$

$\angle BEA = 90°$

In ΔABC, $CF \perp AB$

$\angle CFA = 90°$

$\angle A + \angle H = 180°$

$\Rightarrow \angle H = 180° - 50° = 130°$

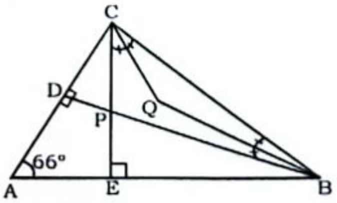
$\angle BHC = 130°$

In ΔBHC, BP & CP are angle bisector of $\angle HBC$ and $\angle HCB$

$\angle BPC = 90° + \frac{\angle BHC}{2} = 90° + \frac{130°}{2}$

$= 90° + 65° = 155°$

316. (c)



In quadrilateral AEPD

$\angle DPE = 360° - (\angle DAE + \angle ADP + \angle PEA)$

$= 360° - (66° + 90° + 90°) = 114°$

$\therefore \angle BPC = \angle DPE = 114°$

(vertically opposite angles -)

$\angle PCB + \angle PBC = 180° - \angle BPC$

$= 180° - 114° = 66°$

$\therefore \frac{1}{2}(\angle PCB + \angle PBC) = 33°$

$\Rightarrow \angle QCB + \angle CBQ = 33°$

$\therefore \angle BQC = 180° - (\angle QCB + \angle CBQ)$

$= 180° - 33° = 147°$

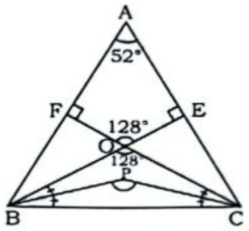
Alternate Method:

$\angle BPC = 180° - 66° = 114°$

$\angle BQC = 90° + \frac{\angle BPC}{2}$

$= 90 + \frac{114°}{2} = 90° + 57° = 147°$

317. (a)



$\angle A = 52°$ (Given),

$\because$ AFOE is a quadrilateral

$\angle FOE = 180° - 52° = 128°$

$\angle BOC = \angle FOE = 128°$

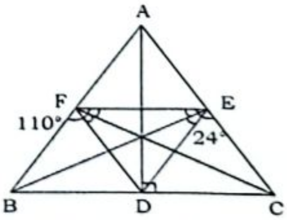
(Vertically opposite angle)

We know that-

$\angle BPC = 90° + \frac{\angle BOC}{2}$

$= 90° + \frac{128°}{2} = 154°$

318. (c)



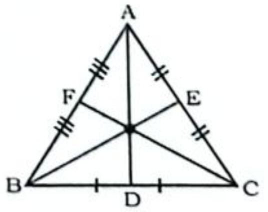
We know, In ΔFDE, BE and CF are bisectors of $\angle E$ and $\angle F$

$\therefore \angle BEF = \angle BED = 24°$

Hence, In ΔBEF,

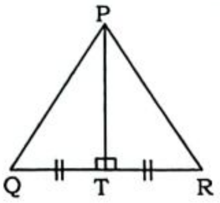
$\angle FBE = 180° - 110° - 24° = 46°$

319. (d)



Intersection point of the medians = Centroid

320. (b)

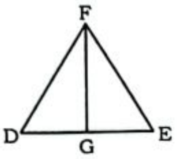


PT is the median of ΔPQR

By apollonius theorem,

$PQ^2 + PR^2 = 2(PT^2 + QT^2)$

321. (b)

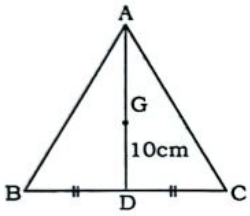


Basically FG is median of Δ DEF but in equilateral triangle median = height

Median = height = $a \times \frac{\sqrt{3}}{2}$

$= 12 \times \frac{\sqrt{3}}{2} = 6\sqrt{3}$

322. (d)

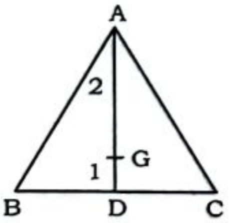


∵ Centroid divides the median into 2 : 1

GD = 1 unit → 10 cm

∴ AD = 3 unit → 30 cm

323. (d)

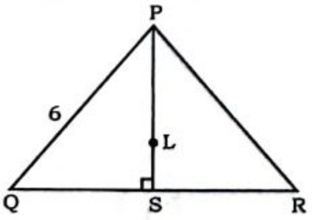


Centroid divides the median in the ratio of 2 : 1.

AG (2 unit) = 14 cm

AD (3 unit) = 21 cm

324. (d)

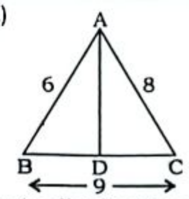


$PS = \frac{\sqrt{3}}{2} \times PQ = 3\sqrt{3}$

$\frac{PL}{LS} = \frac{2}{1}$ (Centroid divides median in 2 : 1)

$\therefore \quad PL = \frac{2}{3} \times PS = \frac{2}{3} \times 3\sqrt{3} = 2\sqrt{3}$

325. (d)



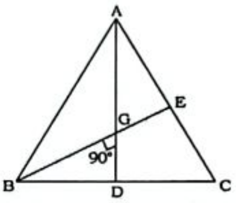
By Apollonius theorem,

$(AB)^2 + (AC)^2 = 2\left[(AD)^2 + \left(\frac{BC}{2}\right)^2\right]$

$\Rightarrow (6)^2 + (8)^2 = 2\left[(AD)^2 + \left(\frac{9}{2}\right)^2\right]$

$\Rightarrow AD = \frac{\sqrt{119}}{2}$ cm

326. (a)



AD = 18 cm, BE = 12 cm

Centroid of a triangle divided the median into the ratio of 2 : 1

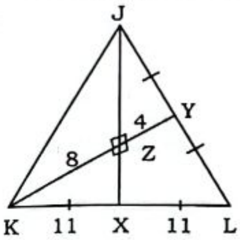
$GD = \frac{1}{3} \times 18 = 6$ cm

$BG = \frac{2}{3} \times 12 = 8$ cm

In ΔBGD,

BD = 10 cm(Triplet of 6, 8, 10)

327. (b)



$KY = 12\text{cm}, KZ = 12 \times \frac{2}{3} = 8\text{cm}$

KL = 22 cm

KX = 11 cm

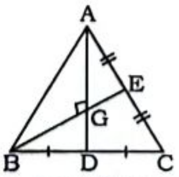
$ZX = \sqrt{121 - 64} = \sqrt{57}$

∵ JZ : ZX = 2 : 1

∵ 1 unit = $\sqrt{57}$

3 unit = $3\sqrt{57}$ cm

328. (d)



Here, point G is centroid.

AG : GD = 2 : 1

$AG = \frac{12 \times 2}{3} = 8$ cm

Similarly, BG : GE = 2 : 1

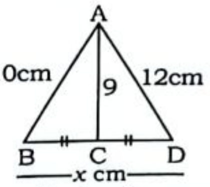
$BG = 9 \times \frac{2}{3} = 6$ cm

Now, $AB^2 = AG^2 + BG^2$

$\Rightarrow AB^2 = 8^2 + 6^2 = 64 + 36 = 100$

∴ AB = 10 cm

329. (a)



By apollonius theorem,

$AB^2 + AD^2 = 2(AC^2 + CD^2)$

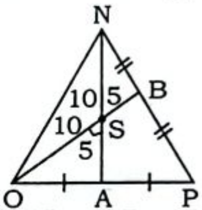
$\Rightarrow (10)^2 + (12)^2 = 2(9^2 + CD^2)$

$\Rightarrow 122 = 81 + CD^2 \Rightarrow 41 = CD^2$

$\Rightarrow CD = \sqrt{41}$

$\therefore BD = 2 \times CD = 2\sqrt{41}$

330. (a)



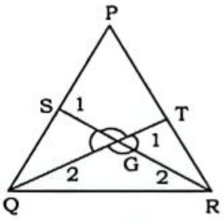
NA = 15cm, OB = 15 cm (Given)

In ⊾OSA,

$OA = \sqrt{(OS)^2 + (SA)^2} = \sqrt{(10)^2 + (5)^2}$

$= \sqrt{100 + 25} = \sqrt{125} = 5\sqrt{5}$ cm

331. (b)



QT = 18 cm, RS = 27 cm

$QG = 18 \times \frac{2}{3} = 12$ cm

RS = 27 cm

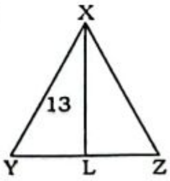
$SG = 27 \times \frac{1}{3} = 9$ cm

From Pythagoras theorem in ⊾SQG,

$\therefore QS = \sqrt{12^2 + 9^2} = \sqrt{144 + 81} = \sqrt{225}$

= 15 cm

332. (c)



Area of $\Delta = \frac{1}{2} \times$ base × height

So, area of Δ depends on base and height of Δ but when height is same then area only depend on base

L is mid point

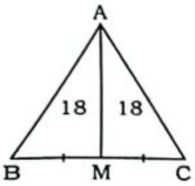
$\frac{YL}{LZ} = \frac{1}{1} = \frac{\text{ar of } \Delta XYL}{\text{ar of } \Delta XLZ}$

Area of Δ XYL = Area of Δ XLZ

Area of Δ XLZ = 13 cm²

Area of Δ XYZ = 13 + 13 = 26 cm²

333. (c)



Given,

Area of ABM = 18cm² and M is the mid point of side BC

We know that,

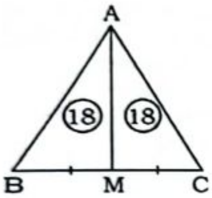
The median divides the Δ in two equal area.

⇒ Area of Δ ABM = Area of Δ ACM = 18 cm²

So,

Area of Δ ABC = Area of Δ ABM + Area of ΔACM = 18 + 18 = 36 cm²

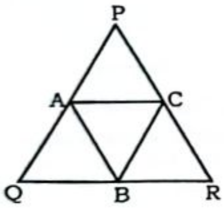
Alternate method:



Total area = 18 + 18 = 36 cm²

Note:- The areas of two or more triangles formed by the same vertex are divided in the ratio of the lengths of the bases.

334. (d)



A and C are the midpoint of PQ and PR.

⇒ AC ∥ QR or BC ∥ PQ

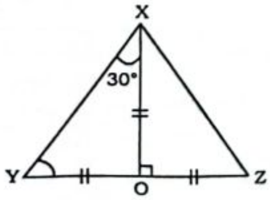
Area of ΔABC = Area of ΔBQA = Area of ΔBRC = Area of ΔPAC

The Area of all four triangles are equal

∴ Area of ΔABC = $\frac{1}{4}$ area of ΔPQR

$= \frac{1}{4} \times 32 = 8$ cm²

335. (c)

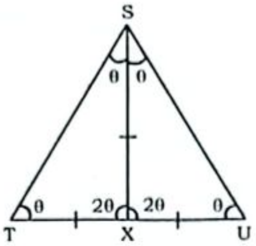


In ΔXYO, OX = OY = $\frac{1}{2}$ YZ

⇒ ∠YXO = ∠XYO = 30° (Opposite angles of equal side is also equal)

∴ ∠XYZ = ∠XYO = 30°

336. (d)



TX = XU [∴ since SX is median]

SX = TX (Given)

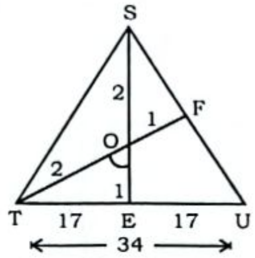
TX = XU = SX

∵ 2θ + 2θ = 180° (linear angle)

⇒ 2θ = 90°

∴ ∠TSU = 90°

337. (d)



If two medians intersect at a point that point called centroid (O).

SO : OE = 2 : 1

OE = 24 × $\frac{1}{3}$ = 8 cm

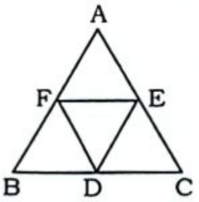
TO : OF = 2 : 1

TO = 22.5 × $\frac{2}{3}$ = 15 cm

So, triangle ΔTOE is a right angle triangle.

∴ ∠TOE = 90°

338. (c)

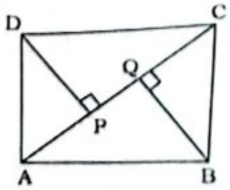


Perimeter of new triangle

$= \frac{\text{Perimeter of original triangle}}{2}$

$= \frac{14.4+15.2+12.4}{2} = \frac{42}{2} = 21$ cm

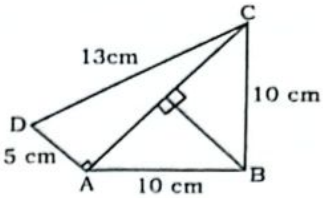
339. (b)



Area of quadrilateral ABCD = $\frac{1}{2}$ × Diagonal × (Sum of perpendicular height)

$= \frac{1}{2} \times 24 \times 10 = 120$cm²

340. (b)



AC = 12 cm (triplet of 5, 12, 13)

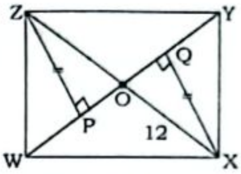
Area of Quadrilateral ABCD

= Area of ΔADC + Area of ΔABC

$= \frac{1}{2} \times 5 \times 12 + \sqrt{16 \times 6 \times 6 \times 4}$

= 30 + 8 × 6 = 30 + 48 = 78 cm²

341.(b)



Consider, ΔOZP and OXQ,

∠ZPO = ∠XQO = 90°

XQ = ZP (given)

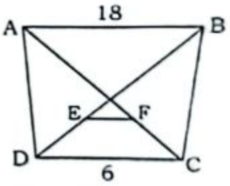
∠ZOP = ∠XOQ

⇒ ΔOZP ≅ ΔOXQ (ASA)

⇒ OZ = OX = 12 cm

⇒ ZX = 24 cm

342. (b)



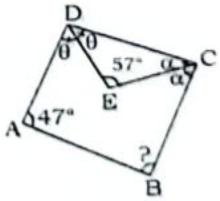
∵ AB | | DC

We know that,

$EF = \frac{AB - CD}{2}$

$= \frac{18-6}{2} = 6$ cm

343. (b)



In ΔDEC,

θ + α = 180° – 57° = 123°

In ABCD

We know that,

∠A + ∠B + ∠C + ∠D = 360°

⇒ 47° + ∠B + 2α + 2θ = 360°

⇒ 47° + ∠B + 2(α + θ) = 360°

⇒ ∠B = 360° – 47° – 246°

⇒ ∠B = 360° – 293°

∴ ∠B = 67°

Alternate Method:

Let, $\angle B = x$

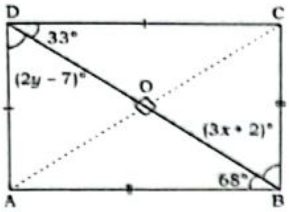
We, know that

$$\frac{\angle A + \angle B}{2} = \angle DEC$$

$$\Rightarrow \frac{47^\circ + x}{2} = 57^\circ \Rightarrow 47^\circ + x = 114^\circ$$

$\therefore x = 67^\circ$

344.(c)



When adjacent side of quadrilateral are same then, diagonal of quadrilateral intersect each other at 90°

So, In ΔAOB, $\angle OAB = 180 - (68^\circ + 90^\circ) = 22^\circ$

Then, In ΔACB, $\angle ACB = 22^\circ$

$[\because AB = BC]$

So, In ΔABC

$\angle A + \angle B + \angle C = 180^\circ$

$\Rightarrow 22^\circ + 22^\circ + (68 + 3x + 2) = 180^\circ$

$\Rightarrow x = 22^\circ$

Now, In ΔDOC,

$\angle DOC + \angle ODC + \angle OCD = 180^\circ$

$\Rightarrow 33^\circ + 90^\circ + \angle OCD = 180^\circ$

$\Rightarrow \angle OCD = 57^\circ$

So, $\angle OAD = 57^\circ$ $[\because AD = DC]$

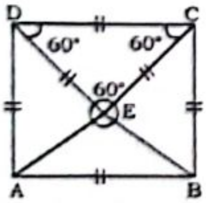
In ΔADC,

$57^\circ + 57^\circ + 33^\circ + 2y - 7^\circ = 180^\circ$

$\Rightarrow y = 20$

$\therefore 2x + 3y = 2 \times 22 + 3 \times 20 = 104$

345. (b)



$\because \Delta DEC$ is an equilateral triangle and side of ΔDEC is also equal to side of square ABCD

Then,

$DC = CB = BA = AD = DE = CE$

$\angle ADE = 90^\circ - 60^\circ = 30^\circ$

Now, $AD = DE$

$\Rightarrow \angle DAE = \angle DEA$

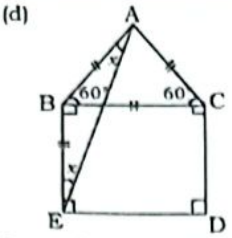
$$= \frac{180^\circ - 30^\circ}{2} = 75^\circ$$

Similarly, $\angle BEC = 75^\circ$

$\therefore \angle AEB = 360^\circ - (2 \times 75^\circ + 60^\circ)$

$= 360^\circ - 210^\circ = 150^\circ$

346. (d)



In equilateral ΔABC,

$\angle B = 60^\circ$

In square BCDE

$\angle B = 90^\circ$

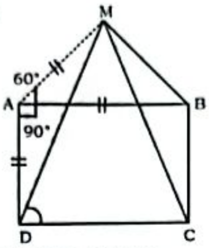
$\because AB = BE$

In isosceles ΔABE

$x + (60^\circ + 90^\circ) + x = 180^\circ \Rightarrow x = 15^\circ$

$\therefore \angle EAB + 3\angle AEB = 4x = 4 \times 15^\circ = 60^\circ$

347. (d)



ABCD is a square.

$\Rightarrow AB = AD,\ AB = AM \Rightarrow AD = AM$

$\Rightarrow \angle ADM = \angle AMD$

In ΔADM,

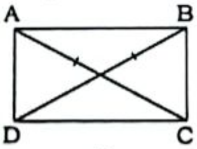
$\angle DAB + \angle BAM + \angle ADM + \angle AMD = 180^\circ$

$\Rightarrow 90^\circ + 60^\circ + 2\angle ADM = 180^\circ$

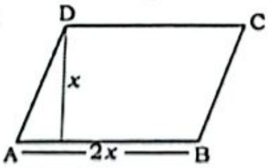
$\Rightarrow \angle ADM = 15^\circ \quad \because \angle ADC = 90^\circ$

$\therefore \angle MDC = 90^\circ - 15^\circ = 75^\circ$

348. (c) A quadrilateral having equal diagonals and equal opposite sides is always a rectangle.



349. (b)



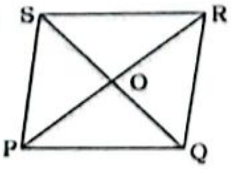
Area of parallelogram = Base × height

$\Rightarrow 144 = 2x \times x$

$\Rightarrow 2x^2 = 144 \Rightarrow x^2 = 72$

$\therefore x = 6\sqrt{2}$ cm

350. (b)



We know, diagonals bisect at 90° in a Rhombus.

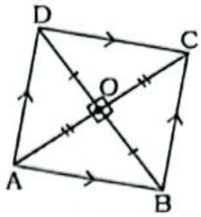
$\Rightarrow \angle SOQ = 90^\circ + 90^\circ = 180^\circ$

Alternate Method:-

$\angle SOQ$ is a straight line angle

So, it will be 180°

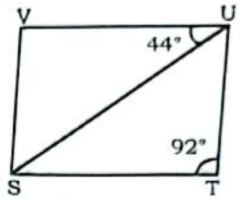
351 (c) Let the point O is the bisector of diagonal.



$\therefore \angle DOB = 180^\circ$ (linear angle)

$$\therefore \frac{5}{9}\angle DOB = 180^\circ \times \frac{5}{9} = 100^\circ$$

352. (d)



$\angle SVU = 92^\circ = \angle STU$ (Two opposite pairs of angles within the rhombus are equal to each other

$\angle TSU = \angle SUV = 44^\circ$

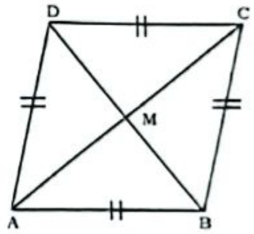
(Alternate interior angle)

$\therefore 4\angle SVU - 3\angle TSU$

$= 4 \times 92^\circ - 3 \times 44^\circ$

$= 368^\circ - 132^\circ = 236^\circ$

353. (d)



Diagonal BD = Side of rhombus

AM is height of equilateral triangle ABD and CM is height of equilateral triangle BCD

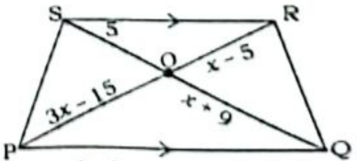
$$AM = CM = \frac{\sqrt{3}}{2} \times \text{side}$$

$$\text{Diagonal } AC = 2 \times \frac{\sqrt{3}}{2} \times \text{side} = \sqrt{3}\ \text{side}$$

$\therefore BD : AC = \text{side} : \sqrt{3}\ \text{side}$

$= 1 : \sqrt{3}$

354. (b)



If diagonal of a trapezium intersect each other then $\frac{SO}{OQ} = \frac{RO}{OP}$

$$\Rightarrow \frac{5}{x+9} = \frac{x-5}{3x-15}$$

$\Rightarrow 15x - 75 = x^2 - 5x + 9x - 45$

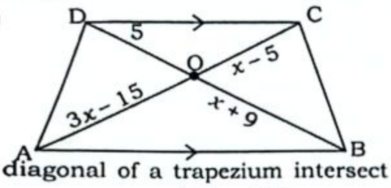
$\Rightarrow x^2 - 11x + 30 = 0$

$\Rightarrow x^2 - 6x - 5x + 30 = 0$

$\Rightarrow (x - 6)(x - 5) = 0 \Rightarrow x = 5, 6$

$\therefore x^2_1 - x_2^2 = 6^2 - 5^2 = 11$

355. (b)



If diagonal of a trapezium intersect each other then $\frac{DO}{OB} = \frac{CO}{OA}$

$\Rightarrow \frac{5}{x+9} = \frac{x-5}{3x-15}$

$\Rightarrow 15x - 75 = x^2 - 5x + 9x - 45$

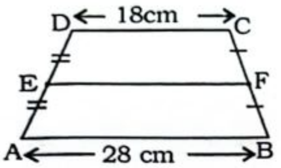
$\Rightarrow x^2 - 11x + 30 = 0$

$\Rightarrow x^2 - 6x - 5x + 30 = 0$

$\Rightarrow (x-6)(x-5) = 0 \Rightarrow x = 5, 6$

$\therefore x_1^2 + x_2^2 = 6^2 + 5^2 = 36 + 25 = 61$

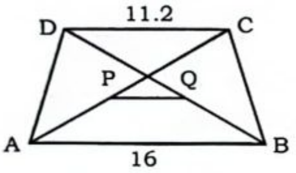
356. (a)



We know that, $EF = \frac{1}{2}(AB + CD)$

$= \frac{1}{2}(28 + 18) = \frac{46}{2} = 23$ cm

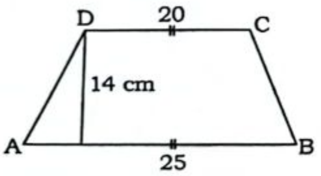
357 (d)



We know, $PQ = \frac{1}{2}(AB - DC)$

$= \frac{1}{2}(16 - 11.2) = 2.4$

358. (d)



We know that,

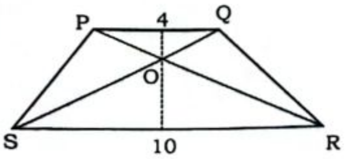
Area of trapezium

$= \frac{1}{2} \times (a + b) \times h$

$= \frac{1}{2} \times (20 + 25) \times 14 = 45 \times 7$

$= 315\text{ cm}^2$

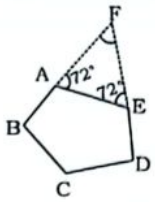
359. (a)



$\Delta POQ \sim \Delta ROS$ (by AAA)

$\frac{ar\Delta POQ}{ar\Delta SOR} = \frac{(4)^2}{(10)^2} = \frac{4}{25}$

360. (b)



No. of sides = 5

Each exterior angle $= \frac{360^\circ}{5} = 72^\circ$

In ΔFAE,

$\angle AFE = 180^\circ - 144^\circ = 36^\circ$

361. (c) We know,

Each external angle $= \frac{360^\circ}{n}$

$\Rightarrow \frac{360^\circ}{n} = 18^\circ \Rightarrow n = 20$

$\therefore$ No. of diagonals $= \frac{n(n-3)}{2}$

$= \frac{20 \times 17}{2} = 170$

362. (c) Sum of interior angles

$= (n-2) \times 180^\circ$

$\Rightarrow (n-2) \times 180^\circ = 2700^\circ$

$\Rightarrow n = 17$

$\therefore$ No. of diagonals $= \frac{n(n-3)}{2}$

$= \frac{17 \times 14}{2} = 119$

363. (a) Decagon = 10 side polygon

Exterior angle $= \frac{360^\circ}{10} = 36^\circ$

interior angle $= 180^\circ - 36^\circ = 144^\circ$

ATQ,

In Regular Polygon

Interior angle $= \frac{15}{16} \times 144^\circ = 135^\circ$

Exterior angle $= 180^\circ - 135^\circ = 45^\circ$

No. of side $= \frac{360^\circ}{45^\circ} = 8$

No. of diagonal of the polygon

$= \frac{8 \times (8-3)}{2} = 20$

Alternate Method:

Decagon = 10 sided polygon.

$\Rightarrow \frac{(n-2)}{n} \times 180^\circ = \frac{15}{16} \times \frac{8}{10} \times 180^\circ$

$\Rightarrow \frac{n-2}{n} = \frac{3}{4} \Rightarrow n = 8$

$\therefore$ No. of diagonals $= \frac{n(n-3)}{2}$

$= \frac{8 \times 5}{2} = 20$

364. (b) Sum of interior angle = 1260°

$(n_1 - 2)\ 180^\circ = 1260^\circ$

$\Rightarrow n_1 - 2 = 7 \Rightarrow n_1 = 9$

In polygon B, each exterior angle

$= 180^\circ - 128\frac{4^\circ}{7} = \frac{360^\circ}{7}$

$\therefore \frac{360^\circ}{n_2} = \frac{360^\circ}{7} \Rightarrow n_2 = 7$

$\therefore n_1 + n_2 = 9 + 7 = 16$

365. (c) In A_1 polygon,

$(n_1 - 2)\ 180^\circ = 1080^\circ$

$\Rightarrow n_1 - 2 = 6 \Rightarrow n_1 = 8$

In A_2 polygon,

$$\begin{array}{l} I + E = 180^\circ \\ I - E = 132^\circ \\ \hline 2E = 48 \\ E = 24^\circ \end{array}$$

Exterior angle $= \frac{360^\circ}{\text{No. of sides}}$

$\Rightarrow \frac{360}{n_2} = 24^\circ \Rightarrow n_2 = 15$

$\therefore n_1 + n_2 = 8 + 15 = 23$

366. (d) Each exterior angle $= 51\frac{3^\circ}{7}$

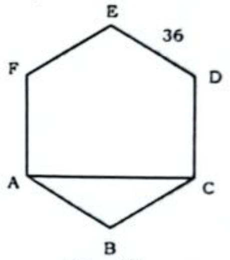
$\Rightarrow \frac{360^\circ}{n} = \frac{360^\circ}{7} \Rightarrow n = 7$

Total no. of diagonal $= \frac{n(n-3)}{2}$

$= \frac{7 \times 4}{2} = 14$

$\therefore$ Required ratio = 14 : 7 = 2 : 1

367. (d)



$\angle ABC = \frac{(n-2)}{n} \times 180^\circ$

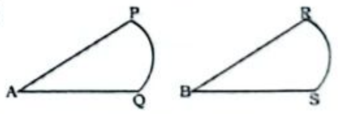
$= \frac{6-2}{6} \times 180^\circ = 120^\circ$

Area of ΔABC

$= \frac{1}{2} \times AB \times BC \times \sin 120^\circ$

$= \frac{1}{2} \times 36 \times 36 \times \frac{\sqrt{3}}{2} = 324\sqrt{3}\text{ cm}^2$

368. (c)



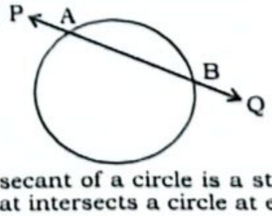
Since, both are congruent

$\Rightarrow PQ = RS$

$\Rightarrow \frac{PQ}{RS} = \frac{1}{1}$

369. (a) The distance between the longest chord and the center of a circle is equal to zero unit.
Since, longest chord of the circle is diameter of circle itself.

370. (c)



A secant of a circle is a straight line that intersects a circle at exactly two points.
$\therefore$ If we extend a chord infinitely on both sides, then the chord becomes a secant.

371. (c) Option (c) is wrong because tangent is a line that touches only one point not intersects two distinct points of a circle.

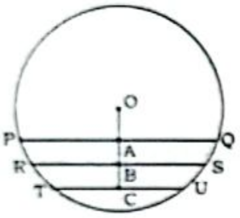
372. (a) It is always possible to draw a circle passing though three non-collinear points in a place.

373. (a) Here AB + BC = AC it means A, B, C are collinear points and we know with three collinear points not a single common circle will pass. So answer will be 0.

374. (b) In a plane if three point are collinear then no circle will be pass so statement (b) is not correct.

375. (c) If two circles touch each other, then the point of contact lies on the line joining the two centers.

376. (d) Option (d) is incorrect



Note:- Length of chord decreases with increase in perpendicular distance
PQ > RS > TU

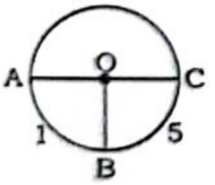
377. (d) Area of circle = πr^2

$\Rightarrow \pi r^2 = 256\pi \quad \Rightarrow r = 16$

∴ Longest chord of circle = diameter

$= 16 \times 2 = 32$

378. (b)



$\frac{AB}{BC} = \frac{x}{5x}$

Perimeter of semi-circle = $x + 5x = 6x$
Perimeter of circle = $6x \times 2 = 12x$

$12x \rightarrow 360°$

$x \rightarrow 30°$

$5x \rightarrow 150°$

$\therefore \angle BOC = 150°$

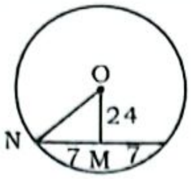
Alternate Method:-

$$(5+1) = \overset{\times 30°}{\overbrace{6 \text{ unit} \rightarrow 180°}}$$

$$\underset{\times 30°}{\underbrace{5 \text{ unit} \rightarrow 150°}}$$

Note:- Length of arc ∝ angle made on centre by this arc.

379. (d)

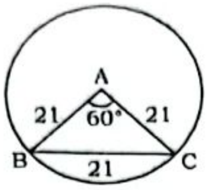


$NO = \sqrt{24^2 + 7^2} = \sqrt{576 + 49}$

$= \sqrt{625} = 25$ cm

Alternate Method:-
7, 24, 25 is a triplet
Hence the length of radius = 25 cm

380. (b)

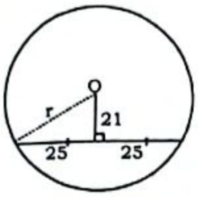


In ΔABC, AB = BC = CA
So ΔABC is an equilateral triangle.
$\angle A = 60°$

Length of arc = $\frac{\theta}{360°} \times 2\pi r$

$= \frac{60°}{360°} \times 2 \times \frac{22}{7} \times 21 = 22$ unit

381. (d)

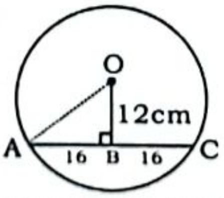


From figure:- using Pythagoras

$r = \sqrt{25^2 + 21^2} = \sqrt{625 + 441}$

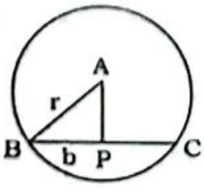
$\Rightarrow r = \sqrt{1066}$ cm

382. (c)



If a line is drawn from the center of the circle, which divides the chord in two equal parts, then, angle made on chord is 90°.
So,
$AO^2 = OB^2 + AB^2$
$= 12^2 + 16^2$
$= 144 + 256 = 400$
∴ AO = 20 (Radius)
NOTE: we can use triplet (12, 16, 20)

383. (b)



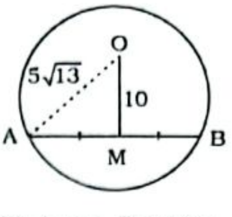
r > b
Chord can be a diameter too i.e
r ≥ b

$\therefore r \geq \frac{20.5}{2}$

$\therefore r \geq 10.25$

384. (a) Given,

$r = 5\sqrt{13}$



We know, OM ⊥ AB

And AM = MB

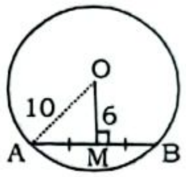
$\Rightarrow AM^2 = OA^2 - OM^2$

$\Rightarrow AM^2 = 25 \times 13 - 100$

$\Rightarrow AM = \sqrt{225} = 15$ cm

∴ Length of chord = 2 × AM = 30 cm.

385. (a)



r = 10 cm

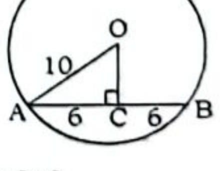
We know, OM ⊥ AB

and AM = BM

$AM = \sqrt{10^2 - 6^2} = 8$

∴ AB = 2 × 8 = 16 cm

386. (b)



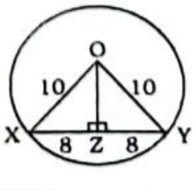
In ΔOAC,

$OC = \sqrt{10^2 - 6^2} = \sqrt{100 - 86} = \sqrt{64}$

= 8 cm.

Note:- By triplet of 6, 8, 10, OC = 8 cm

387. (c)

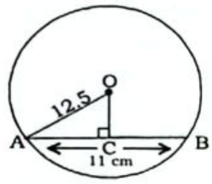


In ΔOXZ,

OZ = 6 cm (Triplet of 6, 8, 10)

∴ Distance of line segment XY from centre = 6 cm.

388. (a)



The line joining the centre of a circle to the mid-point of a chord is perpendicular to chord.

Now,

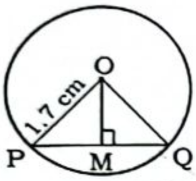
$AO^2 = OC^2 + AC^2$

$\Rightarrow (12.5)^2 = OC^2 + \left(\frac{11}{2}\right)^2$

$\Rightarrow OC^2 = \frac{625}{4} - \frac{121}{4} = \frac{504}{4}$

$\Rightarrow OC = \frac{22.45}{2} = 11.2$

389. (a)



Radius, OP and OQ = 1.7 cm

$\because$ PQ = 3 cm

Perpendicular from the center of a circle to a chord bisects the chord in two equal parts (OM ⊥ PQ)

$PM = MQ = \frac{3}{2} = 1.5$ cm

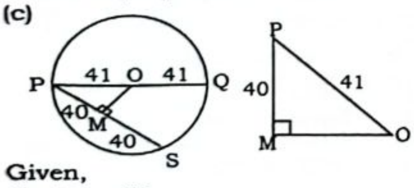
$OM = \sqrt{(1.7)^2 - (1.5)^2} = \sqrt{3.2 \times 0.2}$

$= \sqrt{0.64} = 0.8$ cm

Alternate Method:

(8, 15, 17) triplet, OM = 0.8cm

390. (c)



Given,

d = PQ = 82 cm

$\therefore$ r = PO = OQ = 41 cm

$\because$ The perpendicular from the center of a circle at chord bisects the chord into two equal parts.

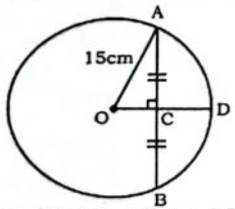
$\therefore$ PM = MS = 40 cm

$\because PO^2 = PM^2 + OM^2$

$\Rightarrow 41^2 = 40^2 + OM^2$

$\Rightarrow OM^2 = 9^2 \Rightarrow OM = 9$

391. (d)



AB = 24 cm ⇒ BC = AC = 12 cm

In ∆OAC, $AC^2 + OC^2 = OA^2$

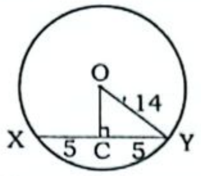
$\Rightarrow OC^2 = 15^2 - 12^2 = 225 - 144 = 81$

$\Rightarrow$ OC = 9 cm

$\therefore$ CD = OD – OC = 15 – 9 = 6 cm

392. (a) Area of circle = 616

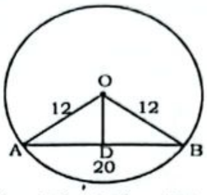
$\Rightarrow \pi r^2 = 616 \Rightarrow r = 14$



Perpendicular from the center of a circle to a chord bisects the chord in two equal parts (OC ⊥ XY)

$OC = \sqrt{14^2 - 5^2} = \sqrt{171}$ cm

393. (c)



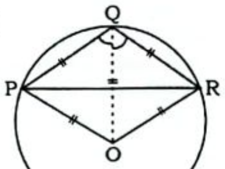
$OD^2 = 12^2 - 10^2 = 144 - 100$

$\Rightarrow OD^2 = 44 \Rightarrow OD = 2\sqrt{11}$

$\therefore$ Area of $\Delta AOB = \frac{1}{2} \times 20 \times 2\sqrt{11}$

$= 20\sqrt{11}$ cm²

394. (d)



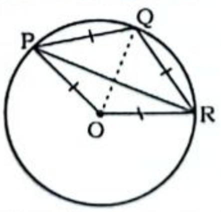
∆POQ and ∆OQR Equilateral triangle

PR = 2 × height of equilateral triangle

$= 2 \times \frac{\sqrt{3}}{2} \times 7$

$= 7\sqrt{3} = \frac{21}{\sqrt{3}}$

Alternate Method:-



From figure, we can see that

PO = OR = QR = QP = 7 cm

Let, OQ = d_1, PR = d_2

⇒ OPQR is a Rhombus

$\Rightarrow d_1^2 + d_2^2 = 4 \times (\text{side})^2$

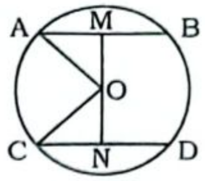
$\Rightarrow OQ^2 + PR^2 = 4 \times PQ^2$

$\Rightarrow 7^2 + PR^2 = 4 \times 7^2$

$\Rightarrow PR^2 = 7^2 (4 - 1) = 3 \times 7^2$

$\Rightarrow PR = 7\sqrt{3} = \frac{21}{\sqrt{3}}$

395. (c)



AM = MB = 4 cm

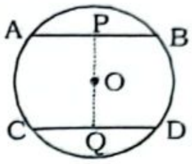
CN = ND = 4 cm

OM= ON = 3 cm

From triplet of 3, 4 and 5

Radius = 5 cm

396. (a)



We know,

if $\frac{AB + CD}{2}$ = distance between two chords.

Here, $\frac{24 + 18}{2} = \frac{42}{2} = 21$

then, $r = \frac{\sqrt{AB^2 + CD^2}}{2}$

$= \frac{\sqrt{24^2 + 18^2}}{2} = \frac{30}{2} = 15$ cm

Alternate Method:-

Directly from options, try and make triplets.

(a) r = 15 cm,

In ∆OPA, (9, 12, 15) ⇒ OP = 9

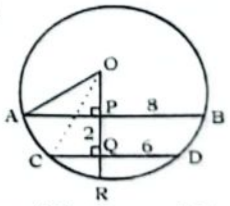
and In ∆OCQ, (9, 12, 15)

⇒ OQ = 12 and OP + OQ

= 9 + 12 = 21

which satisfies.

397. (a)



Given, PQ = 2 cm and OA = OC = radius

Let OP = x,

$OA^2 = OP^2 + AP^2$

$OC^2 = OQ^2 + CQ^2$

$\because OA^2 = OC^2$

$\Rightarrow x^2 + 4^2 = (x + 2)^2 + 3^2$

$\Rightarrow 4^2 - 3^2 = (x + 2)^2 - x^2$

$\Rightarrow 7 = 2\,(2x + 2)$

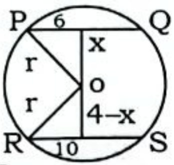
$\Rightarrow x = \frac{3}{4}$

$\because OA^2 = OP^2 + AP^2$

$\Rightarrow OA^2 = \frac{9}{16} + 16$

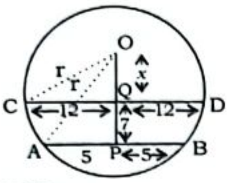
$\Rightarrow OA = \sqrt{\frac{265}{16}} = \frac{\sqrt{265}}{4}$

398. (d)



ATQ,
$6^2 + x^2 = 10^2 + (4 - x)^2$
$\Rightarrow 36 + x^2 = 100 + 16 + x^2 - 8x$
$\Rightarrow 8x = 80 \Rightarrow x = 10$
$6^2 + x^2 = r^2 \Rightarrow 36 + 100 = r^2$
$\Rightarrow r = 2\sqrt{34}$ cm
Diameter of circle = $2 \times 2\sqrt{34}$
$= 4\sqrt{34}$ cm

399. (a)

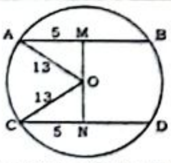


In ΔCOQ,
$r^2 = x^2 + 144$ .....(i)
In ΔAOP,
$r^2 = (x + 7)^2 + 25$
$\Rightarrow r^2 = x^2 + 14x + 74$ .....(ii)
From (i) and (ii),
$x^2 + 144 = x^2 + 14x + 74$
$\Rightarrow 14x = 70 \Rightarrow x = 5$
Now, Put $x = 5$ in equation (i),
$x^2 = 5^2 + 144 \Rightarrow r = 13$ cm
$\therefore$ Diameter = $2 \times r = 2 \times 13 = 26$ cm.

Alternate Method:-
With the help of triplet 5, 12, 13
In ΔOCQ, r = 13, OQ = 5, CQ = 12
In ΔOAP, r = 13, OP = 12, AP = 5
$\therefore$ OP – OQ = 12 – 5 = 7 (verified)
$\Rightarrow$ r = 13 cm
$\therefore$ Diameter = 2r = $2 \times 13 = 26$ cm.

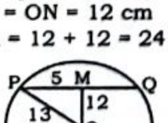
SMART APPROACH:-
We know that diameter is the longest chord it means answer will be greater than 24.
Only option (a) satisfied.

400. (d)



AM = BM = CN = ND = 5 cm
AO = OC = 13 cm
By triplet of 5, 12, 13,
MO = ON = 12 cm
$\therefore$ h = 12 + 12 = 24 cm

401. (c)



In ΔPMO,

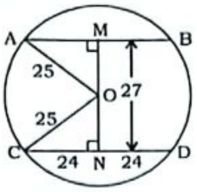
OM = 12(triplet of 5, 12, 13)

In ΔRNO,

ON = 12 (triplet of 5, 12, 13)

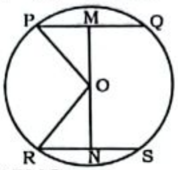
$\therefore$ MN = OM + ON = 12 + 12 = 24 cm.

402. (d)



In ΔOCN,
ON = 7 cm (triplet of 7, 24, 25)
$\therefore$ MO = 27 – 7 = 20 cm
In ΔAMO,
AM = 15 cm (By triplet of 3, 4, 5)
$\therefore$ Length of chord AB = $2 \times$ AM
$= 2 \times 15 = 30$ cm

403. (b)



In ΔPMO,

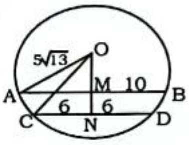
$$MO = \sqrt{7^2 - \left(\frac{5}{2}\right)^2} = \sqrt{49 - \left(\frac{25}{4}\right)}$$

= 6.54 cm
In ΔRNO,

$$NO = \sqrt{7^2 - \left(\frac{8}{2}\right)^2} = \sqrt{49 - 16}$$

= 5.74 cm
Distance between the chords
= 6.54 + 5.74 = 12.28 cm

404. (c)



$$OM = \sqrt{(5\sqrt{13})^2 - 10^2}$$

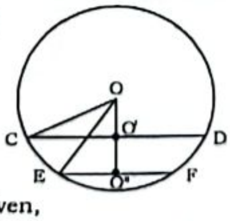
$$= \sqrt{325 - 100} = 15 \text{ cm}$$

$$ON = \sqrt{(5\sqrt{13})^2 - 6^2}$$

$$= \sqrt{325 - 36} = 17 \text{ cm}$$

$\therefore$ MN = ON – OM = 17 – 15 = 2 cm

405. (b)



Given,

Radius = 3, CO' = $\frac{3}{2}$, EO" = 1
O'O" = OO" – OO'

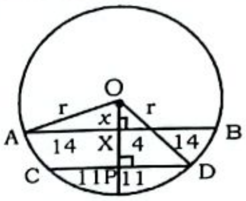
$$O'O" = \sqrt{r^2 - O"E^2} - \sqrt{r^2 - O'C^2}$$

$$= \sqrt{3^2 - 1^2} - \sqrt{3^2 - \left(\frac{3}{2}\right)^2}$$

$$= \sqrt{8} - \sqrt{9 - \frac{9}{4}} = 2\sqrt{2} - \frac{3\sqrt{3}}{2}$$

$$= \frac{4\sqrt{2} - 3\sqrt{3}}{2}$$

406. (c)

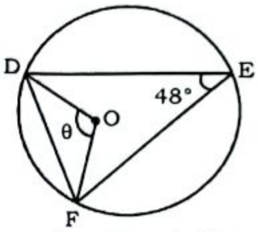


In ΔAOX
$r^2 = x^2 + 14^2$
In ΔOPD
$\Rightarrow r^2 = (x + 4)^2 + 11^2$
$\Rightarrow x^2 + 14^2 = (x + 4)^2 + 11^2$
$\Rightarrow 14^2 - 11^2 = (x + 4)^2 - x^2$
$\Rightarrow 75 = 4(2x + 4)$

$$\Rightarrow \frac{75}{4} = (2x + 4) \quad \therefore x = \frac{59}{8}$$

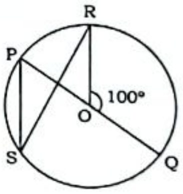
$$r = \sqrt{\left(\frac{59}{8}\right)^2 + 14^2} = 15.82 \text{ cm}$$

407. (b)



The angle subtended by an arc at the centre is double the angle subtended at circumference of the circle by same arc.
2∠DEF = ∠DOF
$\Rightarrow 2(48)^\circ = \angle DOF$
$\Rightarrow \angle DOF = 48^\circ \times 2 = 96^\circ$

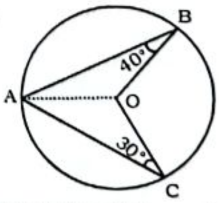
408. (c)



$\angle POR = 180^\circ - 100^\circ = 80^\circ$
The angle made at the circumference of the circle is half of the angle made at the centre

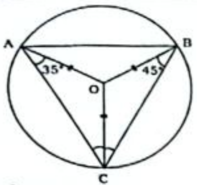
$$\therefore \angle PSR = \frac{\angle POR}{2} = \frac{80^\circ}{2} = 40^\circ$$

409. (b)



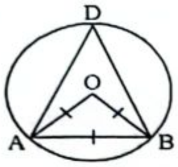
$\because$ OA = OB = OC = radius
$\angle OAB = \angle OBA = 40^\circ$
(angle made by radius)
$\angle OAC = \angle OCA = 30^\circ$
(angle made by radius)
$\angle BAC = \angle OAB + \angle OAC = 40^\circ + 30^\circ$
$= 70^\circ$
$\therefore \angle BOC = 2\angle BAC = 2 \times 70^\circ = 140^\circ$
(The angle subtended by the same arc at the centre is double than the angle subtended at the circumference).

410. (d)



We know,
∠OCB = ∠OBC = 45° (∵ OC = OB)
∠OAC = ∠OCA = 35° (∵ OA = OC)
Now, ∠ACB = ∠OCB + ∠OCA
= 45° + 35° = 80°
∴ ∠AOB = 2 × 80° = 160°

411. (c)



In ΔAOB,

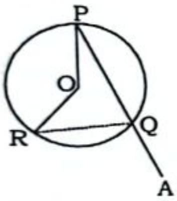
OA = OB = AB

⇒ ΔAOB is an equilateral triangle.

∠AOB = ∠OAB = ∠OBA = 60°

∠ADB = 30° (Angle made at the circumference of circle is half of the angle made at the center by the same chord)

412. (d)



∠POR = 240°

Reflex angle of ∠POR = 360° – 240° = 120°

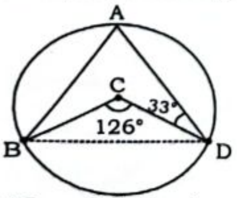
∠PQR = $\frac{120°}{2}$ = 60° (Angle made at the circumference of the circle is half of the angle made at the center by the same arc)
∠PQR + ∠AQR = 180°(Linear angle)
⇒ ∠AQR = 180° – 60° = 120°

Alternate Method:

∠AQR = $\frac{240°}{2}$ = 120°

NOTE: By alternate angle property.

413. (a)



∠BAD = 63° (Angle made at the circumference of the circle is half of the angle made at the center by the same arc)
BC = CD (Radius)

∠CBD = ∠CDB = $\frac{180°-126°}{2}$

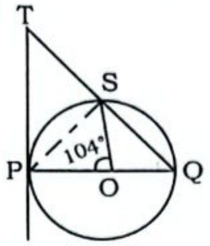
= $\frac{54°}{2}$ = 27°

In ΔABD,

63° + 33° + 27° + 27° + ∠ABC = 180°

⇒ ∠ABC = 180° – 150° = 30°

414. (d)

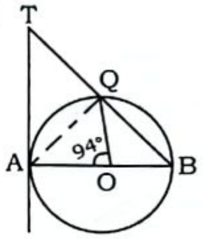


∠SOP = 94° ⇒ ∠SQP = 52° (Angle made at the centre is double than the angle made at the circumference of circle by the same chord)

∠TPO = 90° (PT is a tangent)

∠PTQ = 180° – 90° – 52° = 38°

415. (b)

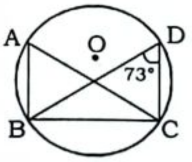


∠AOQ = 94° ⇒ ∠ABQ = 47° (Angle made at the centre is double than the angle made at the circumference of circle by the same chord)

∠TAO = 90° (AT is a tangent)

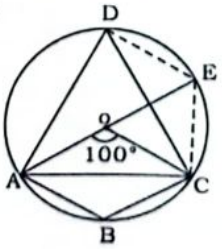
∠ATB = 180° – 90° – 47° = 43°

416. (b)



∠BAC = ∠BDC = 73°
(angle made by same arc BC)
In ΔABC,
∠ABC + ∠BAC + ∠ACB = 180°
⇒ ∠ABC + ∠ACB = 180° – 73° = 107°

417. (a)



OA = OC (Radius)

⇒ ∠OAC = ∠OCA = $\frac{180°-100°}{2}$ = 40°

∠ACE = 90° (Angle made by the diameter at circumference of circle is 90°)

∠CDE = ∠CAE = 40° (Angle made by same arc)

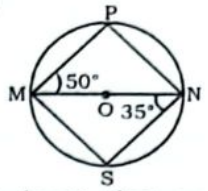
In ΔAEC,

40° + 90° + ∠AEC = 180°

⇒ ∠AEC = 50°

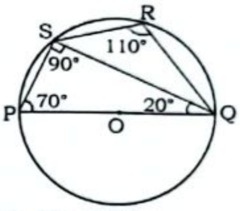
∴ ∠CDE + ∠CEA = 40° + 50° = 90°

418. (a)



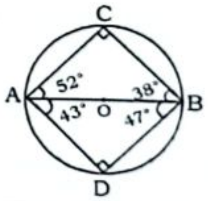
We know that angle made in semicircle is always 90°
⇒ ∠MPN = ∠MSN = 90°
∠MNP = 180° – (90° + 50°) = 40°
∠NMS = 180° – (90° + 35°) = 55°
∠PMS = 50° + 55° = 105°
∠PNS = 35° + 40° = 75°
∴ ∠PMS – ∠PNS = 105° – 75° = 30°

419. (c)



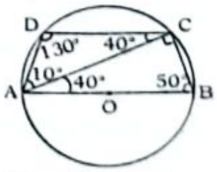
∠P + ∠R = 180°
⇒ ∠P = 180° – 110° = 70°
[∵ PQRS is cyclic quad.]
∠S = 90° (Angle made by diameter in semicircle is always 90°)
In ΔPSQ, 90° + 70° + ∠PQS = 180°
⇒ ∠PQS = 20°

420. (a)



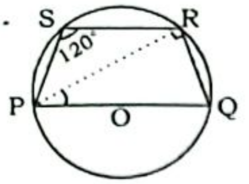
∠ACB = ∠ADB = 90°
(Angle in semicircle)
∠CAD = 43° + 52° = 95°
∠CBD = 38° + 47° = 85°
∴ Required Diff = 95° – 85° = 10°

421. (d)



∠BAC = 40° (given)
∠ACB = 90° (Angle in semicircle)
∵ CD || AB & AC is a transversal line
∠ACD = ∠CAB = 40°
(alternate interior angle)
∠DCB + ∠BAD = 180°
(∵ ABCD is a cyclic quadrilateral)
⇒ (90° + 40°) + 40° + ∠CAD = 180°
⇒ ∠CAD = 180° – (130° + 40°)
⇒ ∠CAD = 10°

422. (a)



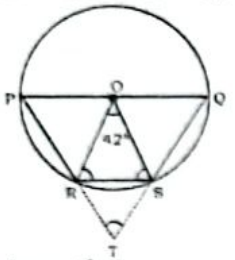
We know,

$\angle PQR = 180° - 120° = 60°$

Also, $\angle PRQ = 90°$ [angle made by diameter.]

$\angle QPR = 180° - 90° - 60° = 30°$

423. (d)



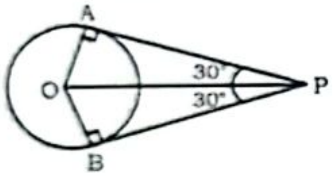
We know that,

PQ ∥ RS

$\angle RTS = 90° - \frac{\angle ROS}{2}$

$= 90° - \frac{42}{2} = 90° - 21 = 69°$

424. (b) Given, radius = OA = 3 cm



By the property of circle,

$\angle OPA = \frac{\angle APB}{2} = \frac{60°}{2} = 30°$

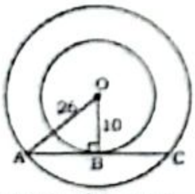
In ΔOAP,

$\tan P = \frac{OA}{AP}$

$\Rightarrow \tan 30° = \frac{3}{AP} \Rightarrow \frac{1}{\sqrt{3}} = \frac{3}{AP}$

$\Rightarrow AP = 3\sqrt{3}$ cm

425. (c)



In ΔAOB, ∠B = 90°

So, By Pythagoras theorem,

$AO^2 = OB^2 + AB^2$

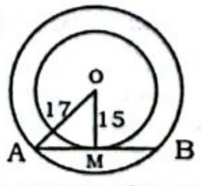
$\Rightarrow 676 = 100 + AB^2$

$\Rightarrow AB = 24$

Then, length of chord AC

$= 2AB = 2 \times 24 = 48$

426. (a)

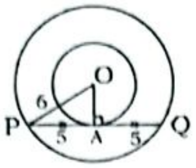


OM = 15 cm, OA = 17 cm,

AM = 8 cm (triplet of 8, 15, 17)

$\therefore AB = 2 \times AM = 2 \times 8 = 16$

427. (a)



We know, ∠OAP = 90°

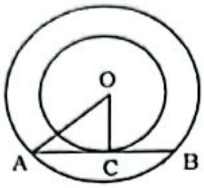
PA = AQ = 5 cm

In ⊾OAP,

$OA^2 = OP^2 - PA^2 = 6^2 - 5^2$

$\Rightarrow OA = \sqrt{11}$

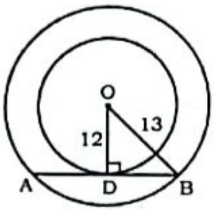
428. (c)



$AC = \sqrt{35^2 - 21^2} = \sqrt{56 \times 14} = 28$ cm

$\therefore AB = 2 \times AC = 2 \times 28 = 56$ cm

429. (c)



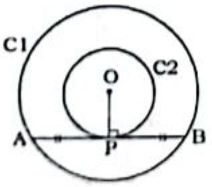
$BD^2 = 13^2 - 12^2$

$\Rightarrow BD = 5$ cm

$\therefore AB = 2BD = 2 \times 5$

$= 10$ cm

430. (d)



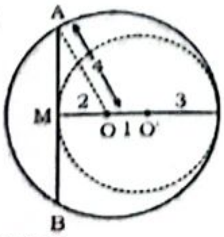
$\because OP \perp AB$

AP = PB

ATQ,

$AP = \frac{AB}{2} = \frac{12}{2} = 6$ cm

431. (d)



In ΔAMO,

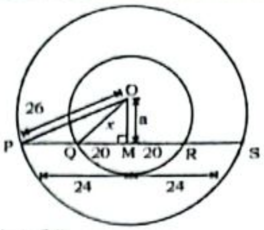
$OM \perp AB$

AM = BM

$AM = \sqrt{4^2 - 2^2} = \sqrt{12} = 2\sqrt{3}$

$\therefore AB = 2 \times AM = 2 \times 2\sqrt{3} = 4\sqrt{3}$

432. (b)



$OM \perp QR$

In ⊾OPM,

$26^2 - 24^2 = a^2$ ...(i)

In ⊾OQM,

$x^2 - 20^2 = a^2$ ...(ii)

From eqⁿ (i) and (ii)

$\Rightarrow 26^2 - 24^2 = x^2 - 20^2$

$\Rightarrow 100 = x^2 - 400$

$\Rightarrow x^2 = 500$

$\therefore x = 10\sqrt{5}$ cm

433. (d) $PS = \frac{PQ + PR + RQ}{2} - RQ$

$= \frac{15 + 12 + 10}{2} - 10 = 8.5$ cm

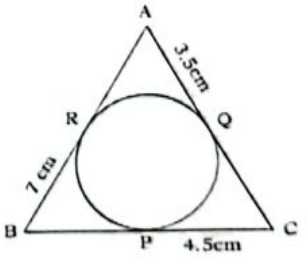
$QT = \frac{PQ + PR + RQ}{2} - PR$

$= \frac{15 + 12 + 10}{2} - 12 = 6.5$ cm

$RU = \frac{PQ + PR + RQ}{2} - PQ$

$= \frac{15 + 12 + 10}{2} - 15 = 3.5$ cm

434. (d)



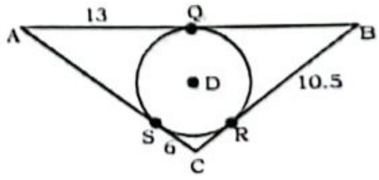
We know that,

Perimeter of ΔABC = 2(AQ + PC + BR)

= 2(3.5 + 4.5 + 7)

= 2 × 15 = 30 cm

435. (b)



AQ = AS = 13

CS = CR = 6

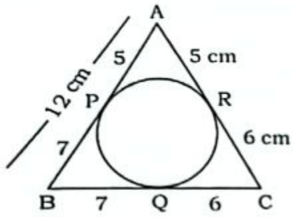
BR = BQ = 10.5

Perimeter of ΔABC

= 2(13 + 10.5 + 6) = 2 × 29.5

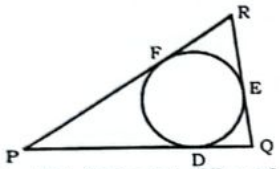
= 59 cm

436. (d)


A
5
5 cm
12 cm
P
R
7
6 cm
B
7
Q
6
C

AR = 5 cm,
AB = 12 cm,
RC = 6 cm
Given,
AR = AP = 5 cm
(Tangent from same point A)
QC = RC = 6 cm
PB = 12 – 5 = 7 cm
BQ = BP = 7 cm
Then sides of Δ are 12, 13 & 11 cm.
Perimeter of Δ = 12 + 13 + 11
= 36 cm

437. (d)



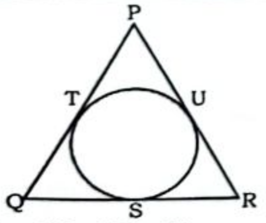
PQ = 15, QR = 11, RP = 13
∵ PQ + QR + RP = PD + PF + FR + RE + EQ + DQ
⇒ 15 + 11 + 13 = 2PD + 2RE + 2EQ
⇒ 39 = 2PD + 2 (RE + EQ)
⇒ 2PD = 39 – 22 ⇒ PD = 8.5

SMART APPROACH:-

PD = semi perimeter of ΔPQR – QR

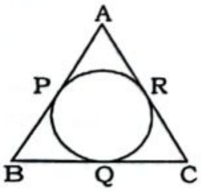
$= \frac{13+15+11}{2} - 11 = 19.5 - 11 = 8.5$ cm

438. (c)



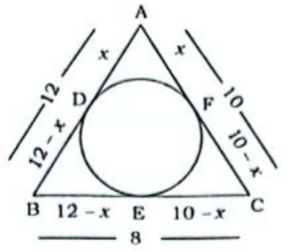
PQ + QR + PR = 32
⇒ PQ + PQ – 5 + PQ – 2 = 32
⇒ 3PQ = 39
⇒ PQ = 13 cm
∴ PR = PQ – 2 = 13 – 2 = 11 cm

439. (c)



AB + BC + CA = 32 (Given)
AB – BC = 4 (Given)
2AB + CA = 36
2AB + CA = 36
AB – CA = 2 (Given)
3AB = 38
$AB = \frac{38}{3}$
AP = AR [∴ tangent of circle]
$\therefore BP + AR = \frac{38}{3}$

440. (d)


A
x
x
12
D
F
10
12 – x
10 – x
B
12 – x
E
10 – x
C
8

We know,
AD = AF, DB = DE, FC = CE
Let, AD = x = AF
DB = 12 – x = EB,
ATQ,
12 – x + 10 – x = 8 ⇒ x = 7
$\therefore \frac{AD}{CE} = \frac{x}{10-x} = \frac{7}{3}$

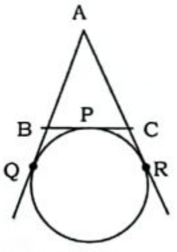
Alternate Method:

$AD = \frac{12+10+8}{2} - 8 = 7$

$CE = \frac{8+10+12}{2} - 12 = 3$

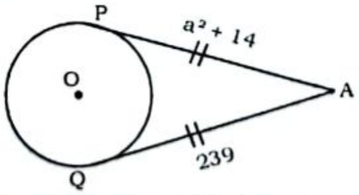
$\therefore \frac{AD}{CE} = \frac{7}{3}$

441. (d)



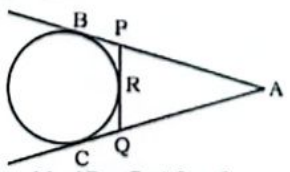
We know that,
$AQ = \frac{1}{2} \times$ perimeter of ΔABC
$= \frac{1}{2} \times 14.1 = 7.05$ cm

442.(c)


P
a² + 14
O
A
239
Q

AP = a² + 14, AQ = 239 (Given)
AP = AQ (Tangent drawn on circle from an external point are equal
⇒ a² + 14 = 239 ⇒ a² = 225
⇒ a = 15

443. (d)

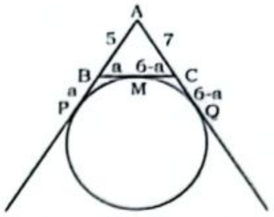


AB = 11, AP = 7, AQ = 9,
we know, PB = PR = 11-7 = 4cm
also, AB = AC = 11
⇒ CQ = RQ = 11 – 9 = 2cm
∴ PQ = PR + RQ = 4 + 2 = 6cm

Alternate Method:

PQ = 2 × AB – AP – AQ
= 2 × 11 – 9 – 7 = 22 – 16 = 6 cm

444. (c)

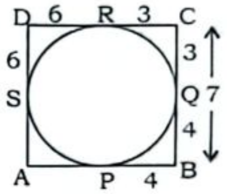

A
5
7
B
a
6-a
C
M
a
P
6-a
Q

Let BM = a ⇒ BP = a
and MC = 6 – a ⇒ CQ = 6 – a
Also, AQ = AP ⇒ 5 + a = 7 + 6 – a
⇒ 2a = 8 ⇒ a = 4
∴ AQ = 7 + 6 – 4 = 9

Alternate Method:

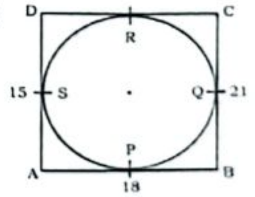
$AP = AQ = \frac{5+6+7}{2} = 9$ cm

445. (b)


D
6
R
3
C
6
S
3
Q
7
4
A
P
4
B

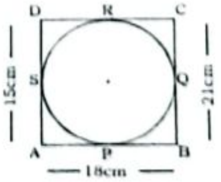
Tangents of a circle from same point is equal.
BP = BQ = 4, CQ = CR = 3,
SD = RD = 6
∴ DC = DR + RC = 6 + 3 = 9 cm

446. (d)


D
C
R
15
S
Q
21
P
A
18
B

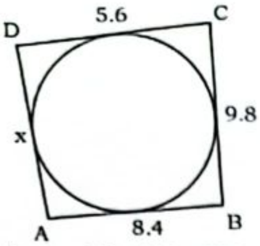
We know that the tangent from same point to the circle is always equal.
PA = AS, DS = DR, RC = CQ, QB = PB
∴ DR + DS + SA + AP + PB + QB + CQ + CR = 15 + 18 + 21 + CD
⇒ 2 (DS + AS) + 2 (QB + CQ) = 54 + CD
⇒ 30 + 42 = 54 + CD ⇒ CD = 18

Alternate Method:


D
R
C
15cm
S
Q
21cm
A
P
B
18cm

We know that,
AB + CD = BC + AD
⇒ 18 + CD = 21 + 15
⇒ CD = 36 – 18
⇒ CD = 18 cm

447. (b)

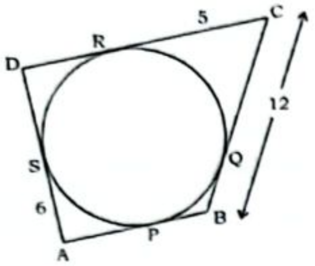


We know, AB + CD = BC + AD

$\Rightarrow 5.6 + 8.4 = 9.8 + x$

$\Rightarrow x = 4.2$

448. (a)



We know,

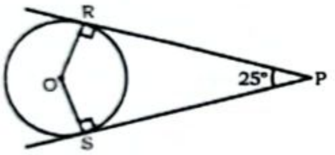
CR = CQ = 5

BQ = 12-5 = 7 = BP .... (i)

also, AS = AP = 6 ....(ii)

∴ AB = AP + PB = 6 + 7 = 13

449. (a)



∠RPS = 25°, ∠ORP = ∠PSO = 90°

[Angle from centre to tangent is 90°]

In quadrilateral PROS

$\angle P + \angle R + \angle O + \angle S = 360°$

$\Rightarrow 25° + 90° + \angle O + 90° = 360°$

$\Rightarrow \angle ROS = 155°$

Alternate Method:

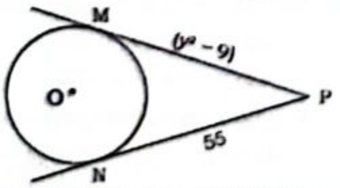
We know,

$\angle ROS + \angle RPS = 180°$

$\angle ROS = 180° - \angle RPS$

$\Rightarrow \angle ROS = 180° - 25° = 155°$

450. (c)

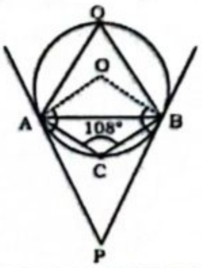


Tangent drawn on circle from an external point are equal.

So, PM = PN

$\Rightarrow y^2 - 9 = 55 \Rightarrow y^2 = 64 \Rightarrow y = 8$

451. (a)



$\angle AQB = 180° - 108° = 72°$

$\angle AOB = 72° \times 2 = 144°$

$\angle APB = 180° - 144° = 36°$

Alternate Method:

If $\angle APB = \theta$,

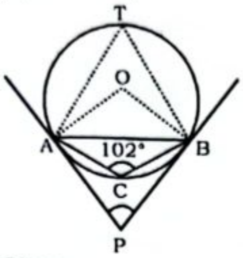
$$\angle ACB = 90° + \frac{\theta}{2}$$

$$\Rightarrow 90° + \frac{\theta}{2} = 108°$$

$$\Rightarrow \frac{\theta}{2} = 18° \Rightarrow \theta = 36°$$

∴ ∠APB = 36°

452. (c) We know,



Given,

∠ACB = 102°

In a cyclic quadrilateral ACBT

$\angle T + \angle C = 180°$

$\Rightarrow \angle T + 102° = 180° \Rightarrow \angle T = 78°$

$\angle O = 2 \times 78° = 156°$

Again, $\angle O + \angle P = 180°$

$\Rightarrow 156° + \angle P = 180°$

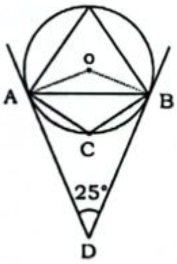
$\Rightarrow \angle P = 24°$

Alternate Method:

$$\angle ACB = 90° + \frac{\angle APB}{2}$$

$$\Rightarrow APB = (102° - 90°) \times 2 = 24°$$

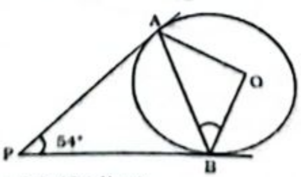
453. (a)



We know, $\angle ACB = 90° + \frac{\angle ADB}{2}$

$= 90° + 12.5° = 102.5°$

454. (a)



OA = OB (Radius)

$\Rightarrow \angle OAB = \angle OBA$

$\angle APB + \angle AOB = 180°$

$\Rightarrow 54° + \angle AOB = 180°$

$\Rightarrow \angle AOB = 126°$

In ΔABO,

Now, $\angle AOB + \angle ABO + \angle BAO = 180°$

(Angle sum property)

$\Rightarrow \angle OBA + \angle OBA = 180° - 126° = 54°$

$\therefore \angle OBA = \frac{54°}{2} = 27°$ (OA = OB)

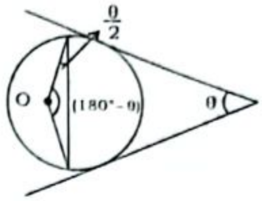
SMART APPROACH:-

We can directly say that:-

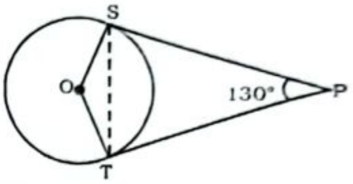
$$\angle OBA = \frac{1}{2}\angle APB$$

$$= \frac{1}{2} \times 54 = 27°$$

Note:-



455. (c)



∠SOT = 180° − 130° = 50°

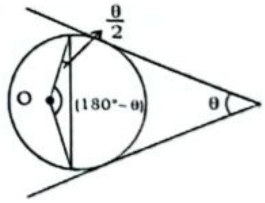
∠OST = ∠OTS (angle made by radius)

So, $\angle OST = \frac{180° - 50°}{2} = 65°$

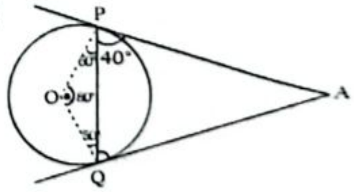
SMART APPROACH:-

$\angle OST = \frac{1}{2}\angle SPT = \frac{1}{2} \times 130° = 65°$

Note:-



456. (d)



∠APO = 90°

(angle on tangent from centre)

Then, ∠OPQ = 90° − 40° = 50°

∠OPQ = ∠OQP = 50° (∵ OP = OQ)

In ΔPOQ,

$\angle OPQ + \angle OQP + \angle POQ = 180°$

$\Rightarrow \angle POQ = 180° - 50° - 50° = 80°$

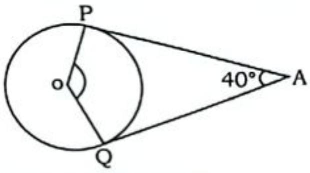
SMART APPROACH:-

∠POQ = 2 × ∠APQ

∠POQ = 2 × 40°

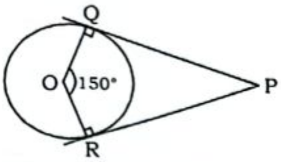
= 80°

457. (d)



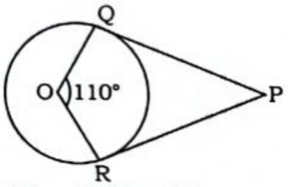
$\angle PAQ + \angle POQ = 180^\circ$
$\Rightarrow 40^\circ + POQ = 180^\circ$
$\Rightarrow \angle POQ = 140^\circ$

458. (d)



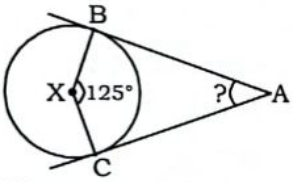
$\angle QOR + \angle QPR = 180^\circ$
$\Rightarrow 150^\circ + \angle QPR = 180^\circ$
$\Rightarrow \angle QPR = 180^\circ - 150^\circ$
$= 30^\circ$

459. (b)



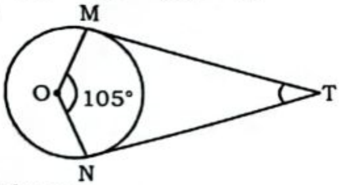
$\angle QOR + \angle QPR = 180^\circ$
$\Rightarrow \angle QPR = 180^\circ - 110^\circ = 70^\circ$

460. (c)



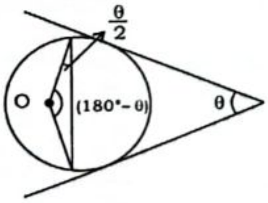
$\angle BAC + \angle BXC = 180^\circ$
$\therefore \angle BAC = 180^\circ - 125^\circ = 55^\circ$

461. (c)

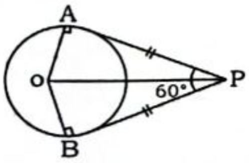


We know,
$\angle MON + \angle MTN = 180^\circ$
$\therefore \angle MTN = 180^\circ - 105^\circ = 75^\circ$

Note:-

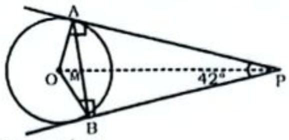


462. (b)



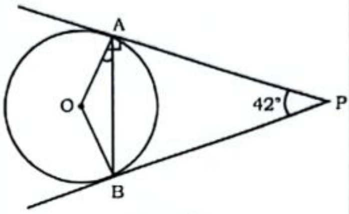
$\Delta AOP \cong \Delta BOP$ (By SAS)
$\Rightarrow \angle APO = \angle BPO = 30^\circ$
In ΔAOP,
$\therefore \angle POA = 180^\circ - 90^\circ - 30^\circ = 60^\circ$

463. (c)



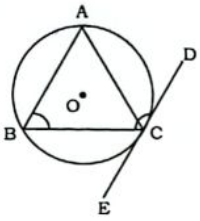
We know that,
$\angle AOB = 180^\circ - \angle APB$ ....(i)
$OA = OB =$ Radius
$\Rightarrow \angle OAB = \angle OBA$
In ΔAOB,
$\Rightarrow \angle OAB + \angle ABO + \angle AOB = 180^\circ$
$\Rightarrow 2\angle OAB = 180^\circ - 180^\circ + 42^\circ$
$\Rightarrow \angle OAB = 21^\circ$

SMART APPROACH:-



$$\angle OAB = \frac{\angle APB}{2} = \frac{42^\circ}{2} = 21^\circ$$

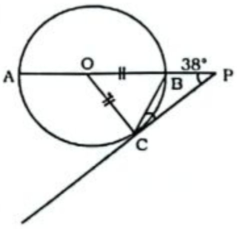
464. (c)



$\therefore \angle ACD = \angle ABC$

Since, angles made by same chord with the tangent is equal to the angle made by that chord on alternate segments.

465. (c)



In ΔOCP,

$\angle OCP + \angle OPC + \angle COP = 180^\circ$

$\Rightarrow \angle COP = 180^\circ - (90^\circ + 38^\circ) = 52^\circ$

In isosceles ΔBOC,

$\angle BCO = \angle CBO$ (Opposite angle of equal sides are also equal)

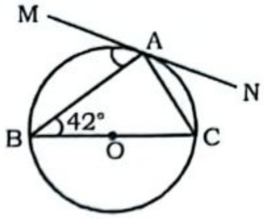
$\angle BCO + \angle CBO + \angle COB = 180^\circ$

$\Rightarrow 2\angle BCO = 180^\circ - \angle COB$

$$\Rightarrow \angle BCO = \frac{180^\circ - 52^\circ}{2} = 64^\circ$$

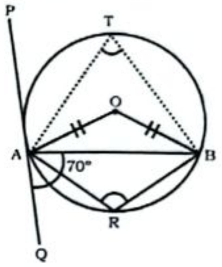
$\angle PCB = \angle OCP - \angle OCB$
$= 90^\circ - 64^\circ = 26^\circ$

466. (b)



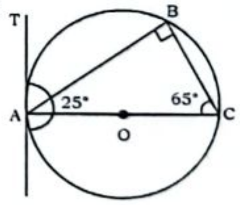
$\angle BAC = 90^\circ$ ($\because$ Angle form on circumference from diameter is 90°)
$\angle ABC = 42^\circ$
In ΔABC,
$\angle ABC + \angle BAC + \angle BCA = 180^\circ$
($\because$ Angle sum property)
$\Rightarrow 42^\circ + 90^\circ + \angle BCA = 180^\circ$
$\Rightarrow \angle BCA = 48^\circ$
$\Rightarrow \angle BCA = \angle BAM = 48^\circ$
($\because$ Alternate Segment theorem)

467. (d)



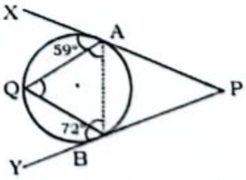
Construction: Draw AT and TB
$\angle BAQ = \angle ATB = 70^\circ$ (By alternate segment theorem)
Now, ATBR is a cyclic quadrilateral
$\Rightarrow \angle ATB + \angle ARB = 180^\circ$
$\Rightarrow \angle ARB = 180^\circ - 70^\circ = 110^\circ$

468. (a)



Given,
$\angle BCA = 65^\circ$
Then, $\angle BAT = \angle BCA = 65^\circ$
(By alternate segment theorem)

469. (d)



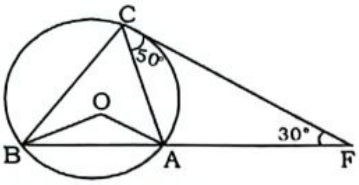
By alternate segment theorem,
$\angle XAQ = \angle ABQ = 59^\circ$
$\angle QBY = \angle QAB = 72^\circ$
In ΔAQB,
$\angle Q = 180^\circ - (59^\circ + 72^\circ) = 49^\circ$

SMART APPROACH:-

$\angle Q = 180^\circ - \angle XAQ - \angle YBQ$
$= 180^\circ - 59^\circ - 72^\circ = 49^\circ$

470. (c) ∠CAB = 50° + 30° = 80°

(External angle property)



∠CBA = 50° (Alternate segment theorem)

∠BAC = ∠FCA + ∠AFC (External angle)

∠BAC = 50° + 30° = 80°

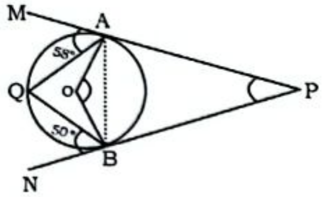
In ΔBCA,

∠BCA = 180° − 50° − 80° = 50°

∠BOA = 2∠BCA = 2 × 50° = 100°

(Angle made at center is double than the angle made at the circumference of circle by the same arc).

471. (c)



By alternate segment theorem :-

∠MAQ = ∠ABQ = 58°

∠QBN = ∠QAB = 50°

⇒ ∠AQB = 180° − (58° + 50°)

⇒ ∠AQB = 72°

⇒ ∠AOB = 2 × 72° = 144°

We know,

∠P = 180° − ∠AOB°

= 180° − 144° = 36°

Alternate Method:

∠AQB = 180° − (58° + 50)

= 72°

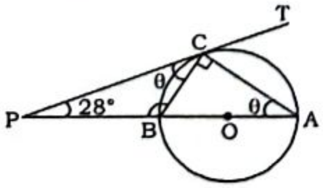
∠AOB = 2 × 72°

= 144°

∴ ∠APB = 180° − 144°

= 36°

472. (b)



Let, ∠BCP = θ

⇒ ∠BAC = θ (By alternate segment theorem)

Also, ∠PBC = ∠BAC + ∠BCA

(Exterior angle property)

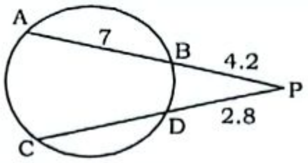
∠PBC = 90° + θ

In ΔPBC,

28° + 90° + θ + θ = 180°

⇒ θ = 31°

473. (d)



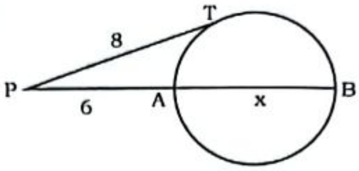
PA × PB = PC × PD

⇒ 11.2 × 4.2 = (2.8 + CD) × 2.8

$$\Rightarrow (2.8 + CD) = \frac{11.2 \times 4.2}{2.8}$$

⇒ CD = 16.8 − 2.8 = 14 cm

474. (c)



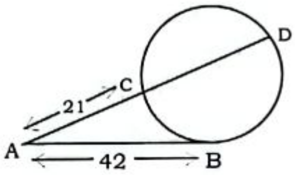
We know that,

$PT^2 = PA \times PB \Rightarrow 8^2 = 6 \times PB$

$$\Rightarrow PB = \frac{64}{6} = \frac{32}{3}$$

$$\therefore\ x = \frac{32}{3} - 6 = \frac{14}{3}\text{ cm.}$$

475. (b)



We know that,

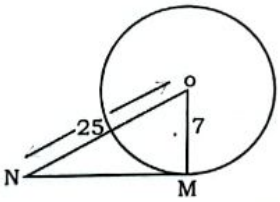
$AB^2 = AC \times AD$

⇒ 42 × 42 = 21 × (21 + CD)

⇒ 84 = 21 + CD ⇒ CD = 63 cm

$$\therefore\ \frac{AB}{CD} = \frac{42}{63} = \frac{2}{3}$$

476. (a)

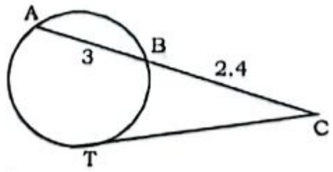


Length of tangent = $\sqrt{25^2 - 7^2}$

= $\sqrt{625 - 49}$ = $\sqrt{576}$ = 24 cm

Note:- By triplet of 7, 24, 25, NM = 24 cm

477. (b)



We know that,

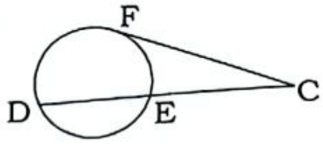
∵ $CT^2 = BC \times AC$

⇒ $CT^2 = 2.4 \times 5.4$

$$\Rightarrow CT = \frac{1}{10}\sqrt{24 \times 54}$$

⇒ CT = 3.6 cm

478. (d)



CD = 20, CF = 15

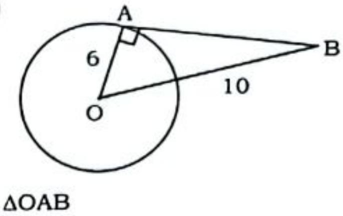
$CD \times CE = CF^2$

⇒ $20 \times CE = 15^2$

$$\Rightarrow CE = \frac{225}{20} = 11.25$$

∴ DE = CD − CE
= 20 − 11.25 = 8.75 cm

479. (d)



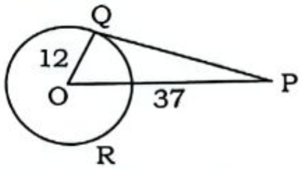
In ΔOAB

∠A = 90°

$AB^2 = 10^2 - 6^2 = 64$

⇒ AB = 8 cm.

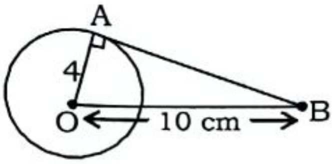
480. (b)



By triplet of 12, 35, 37

Tangent = 35 cm

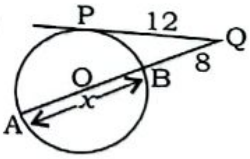
481. (c)



AB = $\sqrt{10^2 - 4^2}$

= $\sqrt{100 - 16}$ = $\sqrt{84}$ = $2\sqrt{21}$ cm

482. (d)



We know,

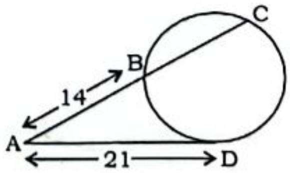
$PQ^2 = QB \times AQ$

⇒ 12 × 12 = 8 × (x + 8)

⇒ 18 = x + 8

⇒ x = 10

483. (d)



$AD^2 = AB \times AC$

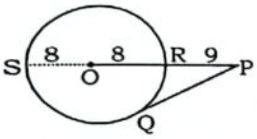
⇒ 21^2 = 14 × AC ⇒ 441 = 14AC

⇒ AC = 31.5 units

∴ BC = AC − AB

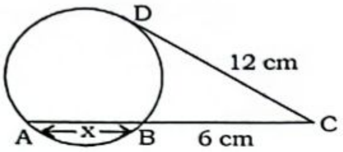
= 31.5 − 14 = 17.5 units

484. (b) Given,
$r = 8$ cm



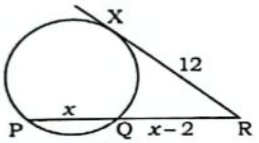
$PR = 17 - 8 = 9$
$PS = 17 + 8 = 25$
We know,
$PQ^2 = PR \times PS$
$\Rightarrow PQ^2 = 9 \times 25$
$\Rightarrow PQ = 3 \times 5 = 15$ cm

485. (b)



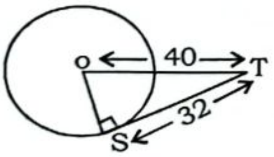
We know that,
$DC^2 = BC \times AC$
$\Rightarrow 12^2 = 6 \times (6 + x)$
$\Rightarrow 144 = 36 + 6x$
$\Rightarrow 6x = 108 \Rightarrow x = 18$

486. (d)



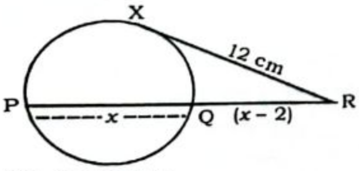
$XR^2 = PR \times QR$
$\Rightarrow 144 = (2x - 2) \times (x - 2) \Rightarrow 144 = 2x^2 - 6x + 4$
$\Rightarrow 2x^2 - 6x - 140 = 0 \Rightarrow x^2 - 3x - 70 = 0$
$\Rightarrow x = 10, -7$ (Negative value not possible)

487. (d)



ATQ,
$TO^2 = TS^2 + OS^2$
$\Rightarrow 40^2 = 32^2 + OS^2$
$\Rightarrow 1600 = 1024 + OS^2$
$\Rightarrow OS^2 = 576$
$\Rightarrow OS = 24$ cm (radius)
Hence, Dimeter of circle = $24 \times 2 = 48$ cm
Note: Used triplet 40, 32, 24

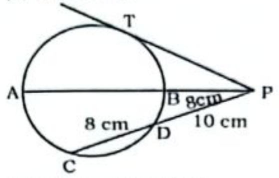
488. (a) A.T.Q.



We know that,
$XR^2 = RQ \times RP$
$\Rightarrow 12^2 = (x - 2)(2x - 2)$
$\Rightarrow 2x^2 - 2x - 4x + 4 = 144$
$\Rightarrow 2x^2 - 6x - 140 = 0$
$\Rightarrow x^2 - 3x - 70 = 0$
$\Rightarrow x^2 - 10x + 7x - 70 = 0$
$\Rightarrow x(x - 10) + 7(x - 10) = 0$
$\Rightarrow (x - 10)(x + 7) = 0$
$\Rightarrow x = 10, -7$ (Not possible)

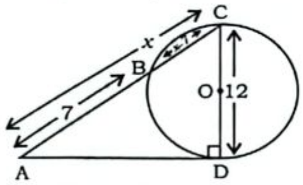
Alternate Method:
We know that,
$RP \times RQ = XR^2$
$\Rightarrow (x - 2)(2x - 2) = 144$
Check the value of x by options.
$\Rightarrow x = 10$ satisfies

489. (a) We know,



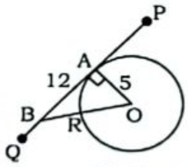
$PB \times PA = PD \times PC$
$\Rightarrow 8 \times PA = 10 \times 18$
$\Rightarrow PA = 22.5$
$PB = 8$ (given)
$\therefore AB = (22.5 - 8) = 14.5$ cm

490. (d)



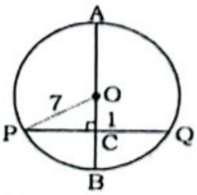
$AD^2 = AB \times AC$ (secant – tangent theorem)
$\Rightarrow AD^2 = 7 \times x$
$\Rightarrow AD = \sqrt{7x}$
$\because AC^2 = AD^2 + DC^2$ (Pythagoras theorem)
$\Rightarrow x^2 = \left(\sqrt{7x}\right)^2 + (12)^2$
$\Rightarrow x^2 = 7x + 144 \Rightarrow x^2 - 7x - 144 = 0$
$\Rightarrow x^2 - 16x + 9x - 144 = 0$
$\Rightarrow (x - 16)(x + 9) = 0 \Rightarrow x = 16$
$\therefore AC = 16$ cm

491. (c)



We know, $\angle OAB = 90°$
Then in $\triangle OAB$,
using triplet (5, 12, 13)
$OB^2 = 5^2 + 12^2$
$\Rightarrow OB = 13$ cm
$\therefore BR = OB - OR$
$= 13 - 5 = 8$ cm

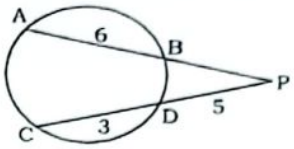
492. (b)



AB is diameter, $AB = 7 \times 2 = 14$ cm.
O is the centre
$\Rightarrow \frac{AC}{BC} = \frac{4}{3}$
$(4 + 3) = 7$ unit → 14 cm
AC (4 unit) → 8 cm
BC (3 unit) → 6 cm

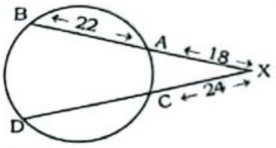
and $OB = \frac{14}{2} = 7$
So, $OC = OB - BC = 7 - 6 = 1$
In triangle PCO,
$PC = \sqrt{PO^2 - OC^2} = \sqrt{(7^2) - 1} = \sqrt{48}$
$\therefore PQ = 2PC = 2\sqrt{48} = 8\sqrt{3}$

493. (c)



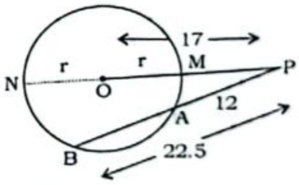
$PB \times AP = PD \times CP$
$\Rightarrow PB \times (6 + PB) = 5 \times 8$
$\Rightarrow PB^2 + 6BP - 40 = 0$
$\Rightarrow PB^2 + 10PB - 4PB - 40 = 0$
$\Rightarrow PB = 4$ cm
NOTE: Put the value from option

494. (c)



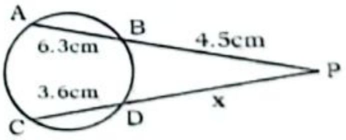
We know,
$XA \times XB = XC \times XD$
$\Rightarrow 18 \times 40 = 24 \times XD$
$\Rightarrow XD = 30$ cm

495. (d)



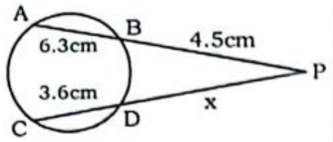
We know,
$PM \times PN = PA \times PB$
$\Rightarrow (17 - r)(17 + r) = 12 \times 22.5$
$\Rightarrow 289 - r^2 = 12 \times 22.5$
$\Rightarrow r^2 = 289 - 270$
$\Rightarrow r = \sqrt{19}$ cm

496. (d)



Let, $PD = x$ cm
We know, $PB \times PA = PD \times PC$
$\Rightarrow PB \times (PB + BA) = PD \times (PD + DC)$
$\Rightarrow 4.5 \times (4.5 + 6.3) = x \times (x + 3.6)$
$\Rightarrow 4.5 \times 10.8 = x^2 + 3.6x$
$\Rightarrow 48.6 = x^2 + 3.6x$
$\Rightarrow 10x^2 + 36x - 486 = 0$
$\Rightarrow 5x^2 + 18x - 243 = 0$
$\Rightarrow x = \frac{-18 \pm \sqrt{18^2 - 4 \times 5 \times (-243)}}{2 \times 5}$
$\Rightarrow x = \frac{-18 \pm 72}{10}$
$\Rightarrow x = \frac{(-18 + 72)}{10} = \frac{54}{10} = 5.4$
$\Rightarrow x = \frac{(-18 - 72)}{10} = \frac{-90}{10}$
$= -9$ [Not possible]

SMART APPROACH:-



$\therefore$ PD×(PD + DC) = PB × (PB +AB)

$x \times (x + 3.6) = 4.5\ (4.5 + 6.3)$

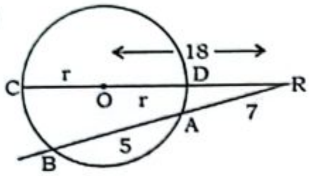
Let, Value x from options.

Option (d) satisfied.

5.4(9) = 4.5(10.8)

10.8 = 10.8

497. (a)



We know,

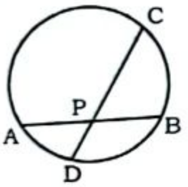
RD × RC = RA × RB

$\Rightarrow (18 - r)\ (18 + r) = 7 \times 12$

$\Rightarrow 324 - r^2 = 84 \Rightarrow r^2 = 240$

$\Rightarrow r = \sqrt{240} = 4\sqrt{15}$

498. (d)



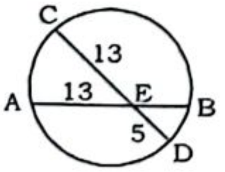
$\because$ AP = AB – PB = 16 – 6 = 10 cm

$\because$ AP × PB = CP × PD

$\Rightarrow$ 10 × 6 = CP × 12

$\Rightarrow$ PC = 5 cm

499. (a)



Given,

CD = 18 cm, DE = 5 cm, AE = 13 cm

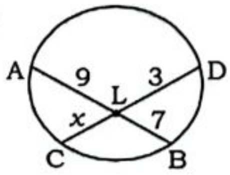
CE = 18 – 5 = 13 cm

We know that,

AE × BE = CE × DE

$\Rightarrow$ 13 × BE = 13 × 5 $\Rightarrow$ BE = 5 cm

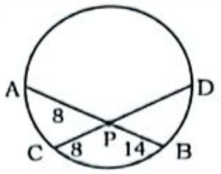
500. (c)



AL × BL = CL × LD

$\Rightarrow$ 9 × 7 = CL × 3 $\Rightarrow$ CL = 21 cm

501. (a)

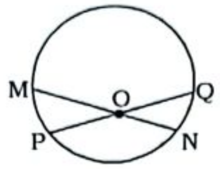


We know that

AP × PB = PC × PD

$\Rightarrow$ 8 × 14 = 8 × PD $\Rightarrow$ PD = 14 cm

502. (a)



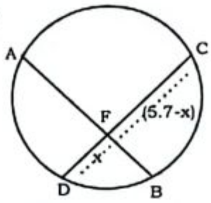
We know that,

MO × ON = PO × OQ

$\Rightarrow$ 9 × 5 = PO × 6

$\Rightarrow PO = \dfrac{9 \times 5}{6} = 7.5$ cm.

503. (b)



Let, DF = x

$\because$ AF × BF = CF × DF

$\Rightarrow 2.4 \times 1.8 = (5.7 - x)x$

By hit and trial,

Let x = 0.9

$\Rightarrow$ 2.4 × 1.8 = 0.9 × 4.8

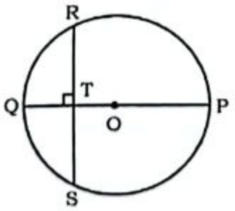
$\Rightarrow$ 2.4 × 1.8 = 1.8 × 2.4

$\therefore$ Longer length = $(5.7 - x)$

= (5.7 – 0.9) = 4.8 cm

504. (a) Given,

RS = 16 cm, QT = 4 cm



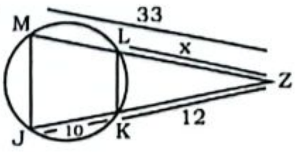
We know,

RT × TS = QT × TP

$\Rightarrow$ 8 × 8 = 4 × TP $\Rightarrow$ TP = 16

$\therefore$ QP = 16 + 4 = 20 cm

505. (b)



Let, LZ = x

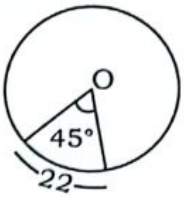
$\because$ JZ × KZ = MZ × LZ

$\Rightarrow (10 + 12) \times 12 = 33 \times x$

$\Rightarrow 22 \times 12 = 33 \times x$

$\Rightarrow x$ = 8cm

506. (a)



Length of arc = 22

$\Rightarrow \dfrac{\theta}{360^\circ} \times 2\pi r = 22$

$\Rightarrow \dfrac{45^\circ}{360^\circ} \times 2 \times \dfrac{22}{7} \times r = 22$

$\Rightarrow$ r = 7 × 4 = 28 cm

507. (a) Length of arc = $2\pi r \times \dfrac{\theta}{360^\circ}$

$= 2 \times \dfrac{22}{7} \times 14 \times \dfrac{90^\circ}{360^\circ} = 22$ cm

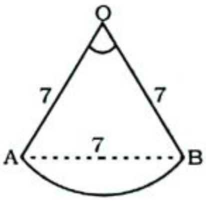
508. (b) Length of arc = $\dfrac{\theta}{360^\circ} \times 2\pi r$

$\Rightarrow \dfrac{2\pi r\theta}{360^\circ} = 22$

$\Rightarrow 2 \times \dfrac{22}{7} \times \dfrac{84^\circ}{360^\circ} \times r = 22$

$\Rightarrow$ r = 15 cm

509. (c)



$\because$ ΔAOB is an equilateral triangle.

∠AOB = 60°

$\therefore$ Length of Arc = $\dfrac{\theta}{360} \times 2\pi r$

$= \dfrac{60^\circ}{360^\circ} \times 2\pi \times 7 = \dfrac{7}{3}\pi$

510. (b) Length of arc = $\dfrac{1}{2}$ × perimeter of circle

$\Rightarrow \dfrac{\theta}{360^\circ} \times 2\pi r = \dfrac{1}{2} \times 2\pi r$

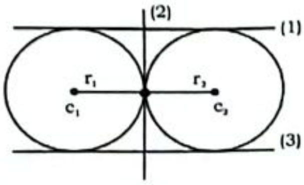
$\Rightarrow \dfrac{\theta}{180^\circ} = 1$

$\Rightarrow \theta = 180^\circ$

Alternate Method:

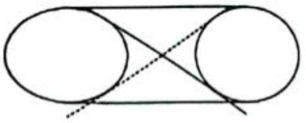
$$\div 2\left(\begin{matrix}2\pi r = 360^\circ \\ \pi r = 180^\circ\end{matrix}\right)\div 2$$

511. (c)



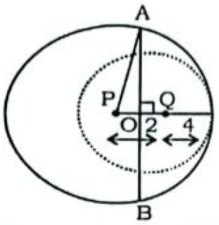
Total tangents = 3

512. (b)



No. of common tangents = 4

513. (d)

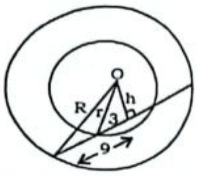


In ΔPOA, $OP = 1cm$, $PA = 6$ cm

$\Rightarrow OA = \sqrt{6^2 - 1^2} = \sqrt{35} = OB$

$\therefore AB = OA + OB = 2\sqrt{35}$ cm

514. (d)



$r^2 = h^2 + 3^2 \Rightarrow h^2 = r^2 - 3^2$ ......(i)

$R^2 = h^2 + 9^2 \Rightarrow h^2 = R^2 - 9^2$ ......(ii)

From eq^n (i) & (ii) we get

$R^2 - 9^2 = r^2 - 3^2$

$R^2 - r^2 = 9^2 - 3^2 = 72$ cm

515. (a) Direct common tangent

$= \sqrt{d^2 - (R-r)^2} = \sqrt{13^2 - (10-8)^2}$

$= \sqrt{169-4} = \sqrt{165}$

516. (b) Direct common tangent

$= \sqrt{d^2 - (R-r)^2}$

$\Rightarrow \sqrt{35} = \sqrt{6^2 - (3-r)^2}$

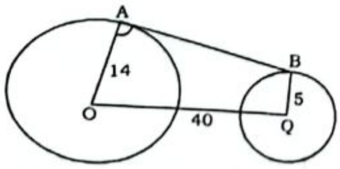
$\Rightarrow 35 = 36 - (9 + r^2 - 6r)$

$\Rightarrow 9 + r^2 - 6r = 1 \Rightarrow r^2 - 6r + 8 = 0$

$r = 2, 4$

But in options, r = 4 is given.

517. (d)



Direct common tangent

$= \sqrt{d^2 - (R-r)^2}$

$= \sqrt{(40)^2 - (14-5)^2} = \sqrt{(40)^2 - (9)^2}$

$= \sqrt{1600-81} = \sqrt{1519}$ cm

518. (a) Length of direct common tangent

$= \sqrt{d^2 - (r_1 - r_2)^2} \Rightarrow d = 10$ units

519. (b) Direct common tangent

$= \sqrt{d^2 - (R-r)^2} = \sqrt{84^2 - (38-26)^2}$

$= \sqrt{(84+12)(84-12)} = \sqrt{96 \times 72}$

$= 48\sqrt{3}$ cm

520. (b) Direct common tangent

$= \sqrt{d^2 - (r_1 - r_2)^2} = \sqrt{81^2 - (51-42)^2}$

$= \sqrt{81^2 - (9)^2} = \sqrt{90 \times 72} = 36\sqrt{5}$

521. (d) Length of direct common tangent

$= \sqrt{d^2 - (R-r)^2} = \sqrt{30^2 - (32-8)^2}$

$= \sqrt{30^2 - 24^2} = \sqrt{54 \times 6}$

$= \sqrt{324} = 18$ cm

522. (a) $PQ = \sqrt{D^2 - (r_1 - r_2)^2}$

$= \sqrt{(17)^2 - (15-7)^2}$

$= \sqrt{17^2 - 8^2} = \sqrt{9 \times 25} = 15$ cm

523. (c) Direct common tangent

$= \sqrt{d^2 - (r_1 - r_2)^2}$

$= \sqrt{35^2 - (25-20)^2} = \sqrt{1225 - 25}$

$= 20\sqrt{3}$ cm

524. (b) Direct common tangent

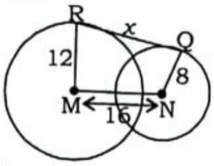
$= \sqrt{d^2 - (r_1 - r_2)^2}$

$= \sqrt{48^2 - (24^2 - 18^2)}$

$= \sqrt{(48)^2 - (6)^2} = \sqrt{54 \times 42}$

$= 18\sqrt{7}$ cm

525. (b)



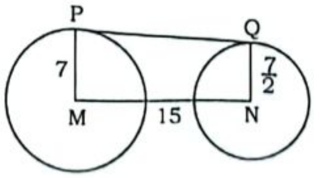
We know,

$QR = \sqrt{MN^2 - (r_1 - r_2)^2}$

$= \sqrt{16^2 - (12-8)^2} = \sqrt{256-16}$

$= \sqrt{240} = 4\sqrt{15}$ cm

526. (a)



given, $MN = 15$, $r_1 = 7$, $r_2 = \frac{7}{2}$

$PQ = \sqrt{MN^2 - (r_1 - r_2)^2}$

$= \sqrt{15^2 - \left(\frac{7}{2}\right)^2} = \sqrt{225 - \frac{49}{4}}$

$= \frac{\sqrt{851}}{2}$

$\sqrt{841} < \sqrt{851} < \sqrt{900}$

$\frac{29}{2} < \frac{\sqrt{851}}{2} < \frac{30}{2}$

$14.5 < \frac{\sqrt{851}}{2} < 15$

option (a) satisfied.

Alternate Method:

Common tangent of two circle is always smaller than the distance between their centres.

Only option (a) satisfied.

527. (b) Transverse common tangent

$= \sqrt{d^2 - (r_1 + r_2)^2}$

$\Rightarrow 6 = \sqrt{d^2 - (3+2)^2}$

$\Rightarrow 36 = d^2 - 25$

$\Rightarrow d^2 = 61 \Rightarrow d = \sqrt{61}$

528. (b) Transverse common tangent

$= \sqrt{d^2 - (r_1 + r_2)^2}$

$\Rightarrow 6 = \sqrt{d^2 - (3+2)^2}$

$\Rightarrow 36 = d^2 - 25$

$\Rightarrow d^2 = 61 \Rightarrow d = \sqrt{61}$

529. (b) Transverse common tangent

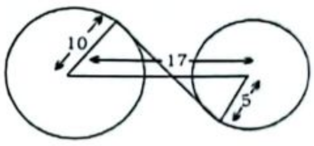
$= \sqrt{d^2 - (r_1 + r_2)^2}$

$\Rightarrow 6 = \sqrt{d^2 - (3+2)^2}$

$\Rightarrow 36 = d^2 - 25$

$\Rightarrow d^2 = 61 \Rightarrow d = \sqrt{61}$

530. (b)



Length of transverse common tangent

$\sqrt{d^2 - (r_1 + r_2)^2} = \sqrt{17^2 - (10+5)^2}$

$= \sqrt{17^2 - 15^2} = \sqrt{32 \times 2}$

$= \sqrt{64} = 8$ cm.

531. (d) Transverse common tangent

$= \sqrt{d^2 - (R+r)^2} = \sqrt{15^2 - (7+5)^2}$

$= \sqrt{225 - 144} = \sqrt{81} = 9$ cm

532. (c) Transverse common tangent

$= \sqrt{d^2 - (R+r)^2} = \sqrt{25^2 - (7+4)^2}$

$= \sqrt{625 - 121} = \sqrt{504} = 6\sqrt{14}$ cm

533. (a) Transverse common tangent

$= \sqrt{d^2 - (r_1 + r_2)^2} \Rightarrow 8 = \sqrt{d^2 - (6+3)^2}$

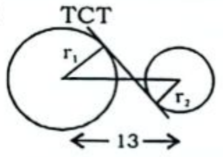
$\Rightarrow 64 = d^2 - 81 \Rightarrow d^2 = 145 \Rightarrow d = \sqrt{145}$

534. (d) Transverse common tangent

$= \sqrt{d^2 - (R+r)^2} = \sqrt{10^2 - (4+2)^2}$

$= \sqrt{64} = 8$ cm

535. (b)

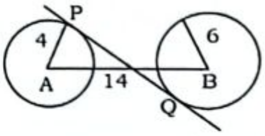


TCT $=\sqrt{d^2-(r_1+r_2)^2}$

$=\sqrt{13^2-(3+2)^2}$

$=\sqrt{13^2-(5)^2}$ = 12 cm

536. (c)

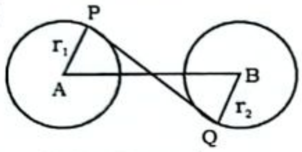


Transverse common tangent (PQ)

$=\sqrt{D^2-(r_1+r_2)^2}=\sqrt{14^2-(4+6)^2}$

$=\sqrt{14^2-10^2}=\sqrt{4\times24}=4\sqrt{6}$

537. (d)



PQ $=\sqrt{AB^2-(r_1+r_2)^2}$

$\Rightarrow 20=\sqrt{AB^2-15^2}$

On squaring,

$\Rightarrow 400 = AB^2-15^2 \Rightarrow 625 = AB^2$

$\Rightarrow$ AB = 25 cm

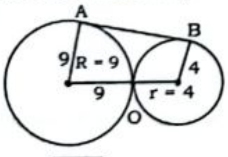
538. (c) Transverse common tangent

$=\sqrt{d^2-(r_1+r_2)^2}=\sqrt{12^2-(5+4)^2}$

$=\sqrt{144-81}=\sqrt{63}$ cm

539. (a) If sum of radii and distance between the centre of two circles is equal then both the circle touches each other externally.

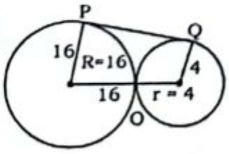
540. (c)



AB $=2\sqrt{R\times r}$

$=2\times\sqrt{9\times4}=2\times3\times2=12$ cm

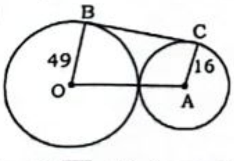
541. (c)



Direct common tangent $=2\sqrt{Rr}$

$=2\times\sqrt{16\times4}=16$ cm

542. (a)



BC $=2\sqrt{Rr}=2\sqrt{49\times16}$

$=2\times7\times4=56$ cm

543. (c) Direct Common Tangent

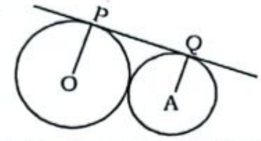
$=2\sqrt{r_1\times r_2}$

$=2\sqrt{18\times8}=2\times12=24$ cm

544. (c) Direct Common Tangent $=2\sqrt{r_1r_2}$

$=2\sqrt{25\times4}=20$

545. (a)

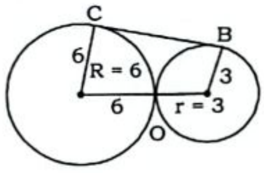


Length of common tangent

$=2\sqrt{Rr}=2\sqrt{12\times5}$

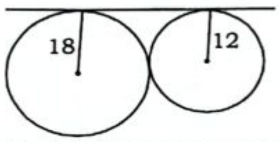
$=2\times2\sqrt{15}=4\sqrt{15}$ cm

546. (d)



Direct common tangent $=2\sqrt{Rr}=2\times\sqrt{6\times3}=6\sqrt{2}$ cm

547. (c)



Length of direct common tangent

$=2\sqrt{Rr}$

$=2\sqrt{18\times12}$

$=2\sqrt{216}=2\times6\sqrt{6}$

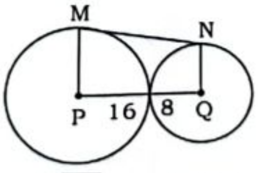
$=12\sqrt{6}$ cm.

548. (c) Length of common tangent when circle touch each other $=2\sqrt{r_1r_2}$

$=2\sqrt{35\times25}$

$=2\times5\times5.9=59\approx59.16$

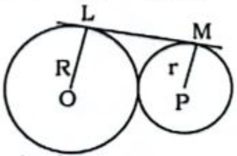
549. (d)



MN $=2\sqrt{r_1r_2}=2\sqrt{16\times8}$

$=2\times8\times\sqrt{2}=16\sqrt{2}$ cm

550. (c)



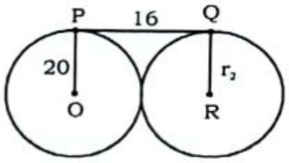
Length of common tangent

$=2\sqrt{Rr}$

$\Rightarrow 12=2\sqrt{18\times r}\Rightarrow 6=\sqrt{18\times r}$

$\Rightarrow 36=18\times r\Rightarrow r=2$ cm

551. (a)



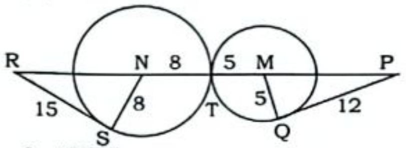
We know, PQ $=2\sqrt{r_1r_2}$

$\Rightarrow 16=2\sqrt{20r_2}\Rightarrow 8=\sqrt{20\times r_2}$

Square on both side-

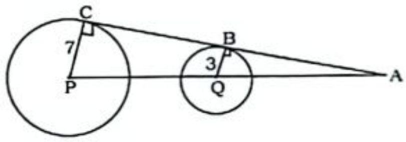
$\Rightarrow \frac{64}{20}=r_2\Rightarrow r_2=3.2$ cm

552. (b)



In ΔPQM,
PM = 13 cm (Triplet of 5, 12, 13)
In ΔRSN,
RN = 17 cm (Triplet of 8, 15, 17)
∴ PR = PM + 5 + 8 + RN = 13 + 5 + 8 + 17 = 43 cm

553. (c)



ΔAPC ~ ΔAQB

Then, AP : AQ = 7 : 3

∴ A divides PQ in ratio of 7 : 3.

The direct common tangent divides the line joining the center of two circles externally in the ratio of their radii.

554. (a) Direct common tangent

$=\sqrt{d^2-(R-r)^2}=\sqrt{60^2-(32-20)^2}$

$=\sqrt{3600-144}=\sqrt{3456}=24\sqrt{6}$ cm

Transverse common tangent =

$\sqrt{d^2-(R+r)^2}=\sqrt{60^2-(32+20)^2}$

$=\sqrt{3600-2704}=\sqrt{896}=8\sqrt{14}$ cm

Required ratio $=24\sqrt{6}:8\sqrt{14}$

$=3\sqrt{3}:\sqrt{7}$

555. (a) Transverse common tangent

$=\sqrt{d^2-(r_1+r_2)^2}$

$=\sqrt{80^2-(35+25)^2}$

$=\sqrt{80^2-(60)^2}=\sqrt{140\times20}$

$=20\sqrt{7}$

Direct common tangent

$=\sqrt{d^2-(r_1-r_2)^2}$

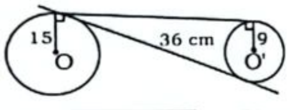
$=\sqrt{80^2-(35-25)^2}=\sqrt{80^2-(10)^2}$

$=\sqrt{90\times70}=30\sqrt{7}$

Required ratio $=20\sqrt{7}:30\sqrt{7}$

$=2:3$

556. (a)



DCT = $\sqrt{d^2-(r_1-r_2)^2} = \sqrt{36^2-(6)^2}$

$= \sqrt{36^2-36} = \sqrt{1260} = 6\sqrt{35}$

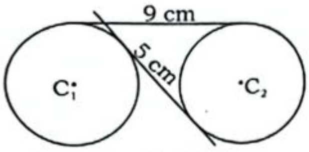
TCT = $\sqrt{d^2-(r_1+r_2)^2} = \sqrt{36^2-(24)^2}$

$= \sqrt{60\times 12} = 12\sqrt{5}$

Sum of DCT + TCT

$= 6\sqrt{35} + 12\sqrt{5} = 6\sqrt{5}(\sqrt{7}+2)$

557. (c)



Direct common tangent

$= \sqrt{d^2-(r_1-r_2)^2}$

$\Rightarrow 9 = \sqrt{d^2-(r_1-r_2)^2}$

$\Rightarrow 81 = d^2-(r_1-r_2)^2$ .....(i)

Transverse common tangent

$= \sqrt{d^2-(r_1+r_2)^2}$

$\Rightarrow 5 = \sqrt{d^2-(r_1+r_2)^2}$

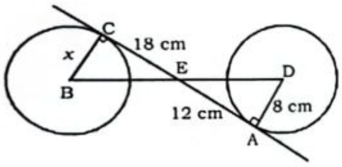
$\Rightarrow 25 = d^2-(r_1+r_2)^2$ .....(ii)

Subtracting equation (ii) from (i)

$(r_1+r_2)^2-(r_1-r_2)^2 = 81-25$

$\Rightarrow 4r_1r_2 = 56 \Rightarrow r_1r_2 = 14$

558. (d) Given,

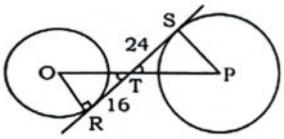


ΔAED ~ ΔCEB

$\Rightarrow \frac{x}{8} = \frac{18}{12}$

$\Rightarrow x = \frac{8\times 18}{12} = 12$

559. (a) Given,



RT = 16 cm, TS = 24 cm,
OR = 10 cm, PS = x cm

In figure,

∠ORT = ∠PST = 90°

∠OTR = ∠PTS (vertically opp. angle)

∴ ∠TOR = ∠TPS

ΔORT ~ ΔPST (By AAA)

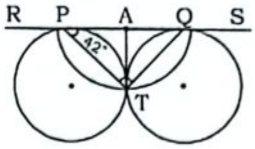
$\Rightarrow \frac{OR}{PS} = \frac{RT}{ST} \Rightarrow \frac{10}{x} = \frac{16}{24}$

$\Rightarrow x = 15$ cm

560. (a) ΔADE ~ ΔCBE

$\Rightarrow \frac{AD}{AE} = \frac{BC}{CE} \Rightarrow \frac{4}{6} = \frac{x}{9} \Rightarrow x = 6$ cm

561. (a)



Given,

∠TPQ = 42°

Also ∠PTQ = 90°

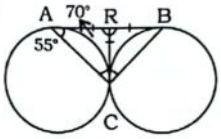
∴ In ΔPTQ,

∠PTQ + ∠TPQ + ∠PQT = 180° (Angle sum property)

⇒ 90° + 42° + ∠PQT = 180°

⇒ ∠PQT = 48°

562. (a)



In ΔARC,

AR = RC (tangents)

⇒ ∠RCA = 55°

∠ARC = 180° – 110° = 70°

In ΔRBC,

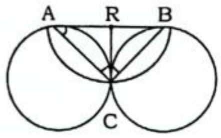
∠CRB = 110° and RC = RB

$\therefore \angle RCB = \angle RBC = \frac{180°-110°}{2}$

$= 35°$

∴ ∠ACB = 55° + 35° = 90°

Alternate Method:

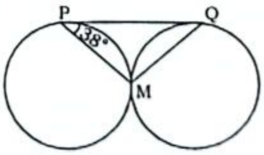


Draw a semicircle taking AB as diameter

RC = RB = RA (Radius)

∠ ACB = 90° (Angle in semicircle)

563. (b)



∠MPQ = 38° (given)

∠PMQ = 90°

(The angle subtended by the direct common tangent at the point where two circles touch each other is 90°)

In ΔPMQ,

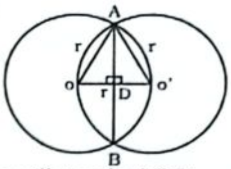
∠P + ∠Q + ∠M = 180°

(Sum of angles of a triangle)

⇒ 38° + ∠Q + 90° = 180°

⇒ ∠Q = 180° – 128° ⇒ ∠Q = 52°

564. (c)



In equilateral ΔAOO'

$AD = \frac{\sqrt{3}r}{2}$

$AB = 2\times\frac{\sqrt{3}r}{2} = \sqrt{3}r$

$\Rightarrow r\sqrt{3} = 14\sqrt{3} \Rightarrow r = 14$cm

Sum of circumference of two circles

$= 2\times 2\pi r = 4\times\frac{22}{7}\times 14 = 176$ cm

Alternate Method:

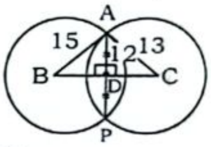
When two circles intersect each other such that each passes through the center of each other then length of common chord is $\sqrt{3}r$.

$\sqrt{3}r = 14\sqrt{3} \Rightarrow r = 14$

Sum of circumference of two circles

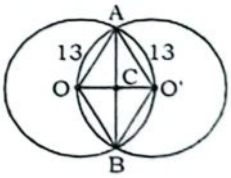
$= 2\times 2\pi r = 4\times\frac{22}{7}\times 14 = 176$ cm

565. (d)



Given,
AP = 24
BD ⊥ AP and DC ⊥ AP
AD = DP = 12
In ⊿ABD,
BD = 9 (By pythagorean triplet)
(9, 12, 15)
In ΔADC,
DC = 5 (By pythagorean triplet)
(5, 12, 13)
∴ BC = DB + DC = 9 + 5 = 14 cm

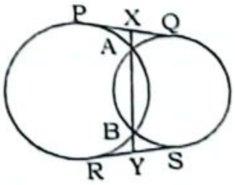
566. (d)



When two circles of equal radii are passing through each other's center, then length of common chord = $R\sqrt{3}$

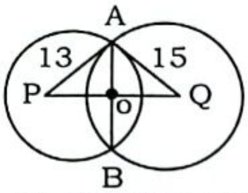
$= 13\sqrt{3}$ cm.

567. (d)



Given,
AB = 3 cm, XY = 5 cm
We know,
$PQ^2 = XY^2 - AB^2$
$PQ = \sqrt{25-9} = 4$ cm

568. (d)



Let, O be the mid point of PQ

AB = 12 cm, AO = OB = 6 cm

$PO = \sqrt{AP^2 - OA^2} = \sqrt{169-36} = \sqrt{133}$

$OQ = \sqrt{AQ^2 - OA^2} = \sqrt{225-36} = \sqrt{189}$

$\therefore PQ = PO + OQ = \sqrt{133} + \sqrt{189}$

Alternate Method:

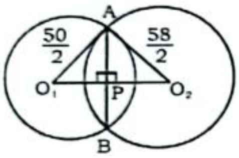
$PQ = \sqrt{R^2 - \left(\frac{AB}{2}\right)^2} + \sqrt{r^2 - \left(\frac{AB}{2}\right)^2}$

$= \sqrt{15^2 - \left(\frac{12}{2}\right)^2} + \sqrt{13^2 - \left(\frac{12}{2}\right)^2}$

$= \sqrt{225-36} + \sqrt{169-36}$

$= \sqrt{189} + \sqrt{133}$

569. (c)



Given,

$AB = 40,\ AO_1 = 25$ cm

$AO_2 = 29$ cm

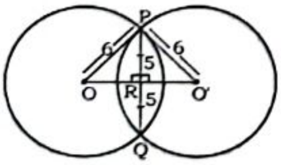
AP = PB = 20 cm

Then, $O_1P = \sqrt{25^2 - 20^2} = 15$ cm

$O_2P = \sqrt{29^2 - 20^2} = 21$ cm

$\therefore O_1O_2 = 15 + 21 = 36$ cm

570. (d)



PQ = 10 cm

$PR = \frac{1}{2} \times 10 = 5$ cm

$OR = \sqrt{OP^2 - PR^2} = \sqrt{36-25} = \sqrt{11}$

$RO' = \sqrt{O'P^2 - PR^2}$

$= \sqrt{36-25} = \sqrt{11}$

OO' = OR + RO'

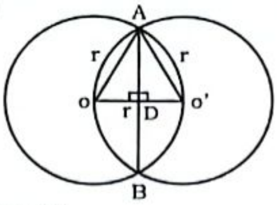
$= \sqrt{11} + \sqrt{11} = 2\sqrt{11}$ cm

Alternate Method:

$OO' = \sqrt{4R^2 - (PQ)^2} = \sqrt{4 \times 6 \times 6 - (10)^2}$

$= \sqrt{144-100} = \sqrt{44} = 2\sqrt{11}$

571. (a)



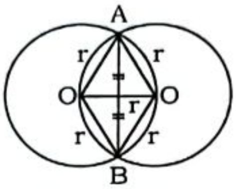
In ΔAOO'

$AD = \frac{\sqrt{3}}{2} r,\ AB = \sqrt{3}\, r$

$\Rightarrow 24 = \sqrt{3}\, r \Rightarrow r = 8\sqrt{3}$

Diameter $= 2 \times 8\sqrt{3} = 16\sqrt{3}$

572. (a)



When two circle have equal radius then Common Chord (AB) = $\sqrt{3}r$

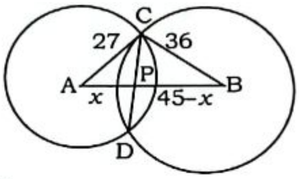
Sum of diameter of two circles

= 84cm (given)

$\Rightarrow 2(r + r) = 84 \Rightarrow r = 21$

$\therefore$ Common chord $= \sqrt{3}r = 21\sqrt{3}$

573. (c)



ATQ,

$27^2 - x^2 = 36^2 - (45 - x)^2$

$\Rightarrow 729 - x^2 = 1296 - (2025 + x^2 - 90x)$

$\Rightarrow 90x = 1458 \Rightarrow x = 16.2$

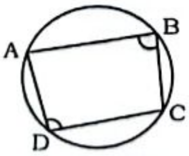
$CP = \sqrt{27^2 - x^2} = \sqrt{27^2 - 16.2^2}$

$= \sqrt{466.56} = 21.6$ cm

Length of common chord = 2 × CP

= 2 × 21.6 = 43.2 cm

574. (d)

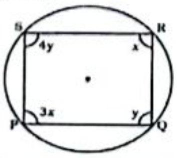


∠B + ∠D = 180° (sum of opposite angle of a cyclic quadrilateral is always 180°)

$\Rightarrow x + 10° + 2x + 35° = 180°$

$\Rightarrow x = 45°$

575. (d)



Let $\angle R = x° \Rightarrow \angle P = 3x°$

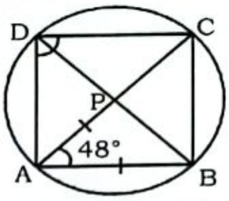
Let, $\angle Q = y° \Rightarrow \angle S = 4y°$

$5y = 180° \Rightarrow y = 36°$

$4x = 180° \Rightarrow x = 45°$

$\therefore\ \angle R + \angle S = x + 4y = 45° + 144° = 189°$

576. (d)



∠ABC = ∠ACB [∵ AB = AC]

∵ ∠BAC + ∠ABC + ∠ACB = 180°

[Angle sum property]

So, ∠ABC = ∠ACB

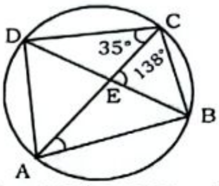
$= \frac{(180° - 48°)}{2} = \frac{132°}{2} = 66°$

Also, ∠ADC + ∠ABC = 180°

⇒ ∠ADC + 66° = 180°

⇒ ∠ADC = 180° – 66° = 114°

577. (b)



⇒ ∠BEA = 180° – 138° = 42°

Also, ∠ECD = 35° = ∠EBA

(Angle in same segment)

In ΔAEB, ∠BAE = 180° – (35° + 42°)

= 103°

∴ ∠BAC = 103°

Alternate Method:

In ΔDEC,

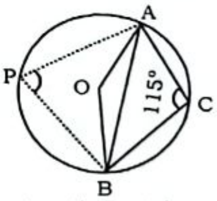
∠EDC + 35° = 138° (Exterior angle)

∠EDC = 138° – 35° = 103°

∠CAB = ∠EDC = 103°

(Angle in same segment)

578. (c)



Construction = take a point P at the circle and connect PA and PB

In cyclic Quadrilateral

∠C + ∠P = 180°

∠APB = 180° – 115° = 65°

∠AOB = 65° × 2 = 130°

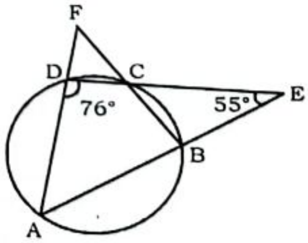
Now OA = OB = radius

⇒ ∠OAB = ∠OBA

∴ 2∠OAB = 180° – 130°

⇒ ∠OAB = 25°

579. (d)



In ΔADE

∠DAE = 180° – (76° + 55°) = 49°

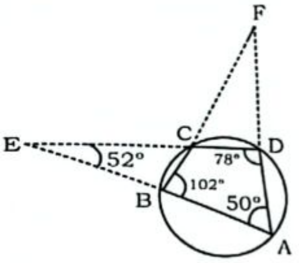
∠B + ∠D = 180° (Sum of opposite angle of a cyclic quadrilateral is 180°)

In ΔAFB

∠B = 180° – 76° = 104°

∴ ∠AFB = 180° – (49° + 104°) = 27°

580. (d)



In ΔAED,

$\angle A = 180° - (78° + 52°) = 50°$

Also, $\angle B = 180° - 78° = 102°$

In ΔBAF,

$\angle AFB = 180° - (102° + 50°) = 28°$

Alternate Method:

$\angle A = 180° - (78° + 52°) = 50°$

$\Rightarrow EAD = 90° - \left(\frac{\angle E + \angle F}{2}\right)$

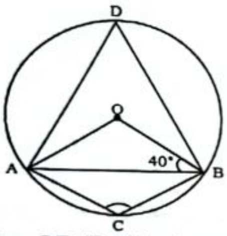
$\Rightarrow 50° = 90° - \left(\frac{52° + \angle F}{2}\right)$

$\Rightarrow 40° = \frac{52° + \angle F}{2}$

$\Rightarrow 80° = 52° + \angle F$

$\Rightarrow \angle F = 28°$

581. (c)



AO = OB (Radii of same circle)

$\Rightarrow \angle ABO = \angle BAO = 40°$

In ΔAOB

$\Rightarrow \angle ABO + \angle AOB + \angle OAB = 180°$

$\Rightarrow 40° + 40° + \angle AOB = 180°$

$\Rightarrow \angle AOB = 100°$

$\therefore \angle ADB = \frac{100°}{2} = 50°$

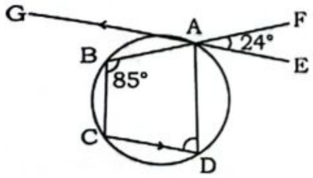
In Cyclic quadrilateral ACBD:

$\Rightarrow \angle ADB + \angle ACB = 180°$

(∵ Sum of opposite angle of cyclic quadrilateral is 180°)

$\Rightarrow \angle ACB = 180° - 50° = 130°$

582. (d)



$\angle ADC = 180° - 85° = 95°$

(Sum of opposite angles of a cyclic quadrilateral is 180°)

AE||CD,

$\Rightarrow \angle GAB = 24°$ (Vertically opposite angle)

$\Rightarrow \angle GAD = 180° - 95° = 85°$

$\therefore \angle BAD = 85° - 24° = 61$

$\therefore \angle BCD = 180° - 61° = 119°$

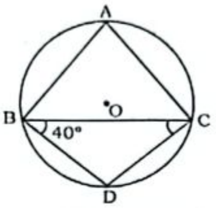
Alternate Method:

$\angle DAE = \angle ADC = 180° - 85° = 95°$

$\angle DAF = \angle BCD = 95° + 24° = 119°$

(∠DAF = ∠BCD by interior angle property)

583. (c)



Given: ΔABC is an equilateral triangle.

$\therefore \angle ABC = \angle BCA = \angle BAC = 60°$

$\angle CBD = 40°$

$\therefore \angle ABD = 60° + 40° = 100°$

Also, ABDC is a cyclic quadrilateral

$\angle ABD + \angle ACD = 180°$

(∵ The sum of opposite angle of cyclic quadrilateral is 180°)

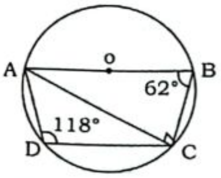
$\Rightarrow \angle ACD = 180 - 100 = 80°$

$\therefore \angle ACD = \angle ACB + \angle BCD$

$\Rightarrow 80° = 60° + \angle BCD$

$\Rightarrow \angle BCD = 20°$

584. (b)



In cyclic quad. ABCD

$\angle ABC = 180° - 118° = 62°$

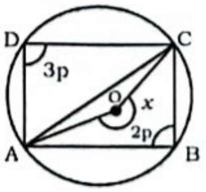
$\angle ACB = 90°$ (angle in semicircle)

In ΔABC,

$\therefore \angle BAC = 90° - 62° = 28°$

585. (d) Given

ABCD is a cyclic quadrilateral O is the centre of the circle



$\angle ABC = 2p$, $\angle ADC = 3p$

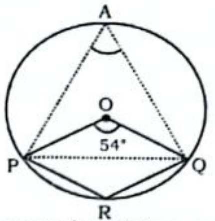
Since, ABCD is cyclic quadrilateral

$\Rightarrow 2p + 3p = 180°$

$\Rightarrow p = \frac{180}{5} = 36°$

$\therefore$ Reflex $\angle AOC = 3P \times 2 = 6P = 6 \times 36 = 216°$

586. (d)



Construction: Take a point on a circle at the point A and connect PA and QA

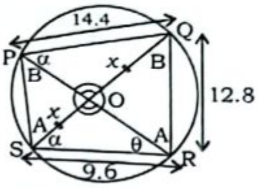
So, $\angle PAQ = \frac{\angle POQ}{2} = \frac{54°}{2} = 27°$

$\angle PRQ + \angle PAQ = 180°$

(∵ Sum of opposite angle of cyclic quadrilateral is 180°)

$\Rightarrow \angle PRQ = 180° - 27° = 153°$

587. (d)



Let, SO = OQ = x

ΔPOQ ~ ΔSOR

$\Rightarrow \frac{SR}{PQ} = \frac{x}{PO} \Rightarrow \frac{9.6}{14.4} = \frac{x}{PO}$

$\Rightarrow PO = \frac{14.4x}{9.6}$

ΔPOS ~ ΔQOR

$\Rightarrow \frac{QR}{PS} = \frac{QO}{PO} \Rightarrow \frac{12.8}{PS} = \frac{x}{PO}$

$\Rightarrow \frac{14.4x}{9.6} = \frac{PS \times x}{12.8} \Rightarrow PS = 19.2$ cm

Alternate Method:

PQRS is a cyclic quadrilateral.

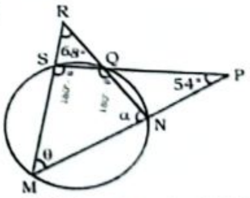
By direct result,

If one diagonal bisect other

$\Rightarrow \frac{PS}{QR} = \frac{PQ}{SR}$

$\Rightarrow \frac{PS}{12.8} = \frac{14.4}{9.6} \Rightarrow PS = 19.2$ cm

588. (a)



Let ∠RMN = θ and ∠MNR = α

We know, sum of opposite angles in cyclic quadrilateral is 180°

So, ∠PSM = 180° − α

In ΔRMN,

$\angle RMN + \angle MNR + \angle MRN = 180°$

$\Rightarrow \theta + \alpha + 68° = 180°$

$\Rightarrow \theta + \alpha = 112°$ ....(i)

Again, in ΔPSM,

$\Rightarrow \angle PSM + \angle SMP + \angle MPS = 180°$

$\Rightarrow 180° - \alpha + \theta + 54° = 180°$

$\Rightarrow \theta + 54° = \alpha$

From equation (i)

$\Rightarrow \theta + \theta + 54° = 112°$

$\Rightarrow 2\theta = 112° - 54°$

$\Rightarrow \theta = \dfrac{58°}{2}$

$\Rightarrow \theta = 29°$

Therefore, ∠RMN = ∠SMN = 29°

Alternate Method:-

$\alpha = \theta + 54$ (External angle)

In Δ MRN

$\theta + \alpha + 68 = 180°$

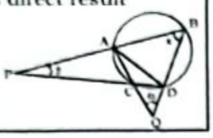
$\theta + \theta + 54 + 68 = 180°$

$\theta = 29°$

SMART APPROACH:-

Just remember this direct result

$$\boxed{x = 90° - \frac{(\alpha + \beta)}{2}}$$



589. (d) Minute hand covers 2π in 60 minutes

60 minute → 2π

25 minute → $\dfrac{2\pi}{60} \times 25 = \dfrac{5\pi}{6}$

590. (c) Sum of angles = 180° − 3 × 17° = 129°

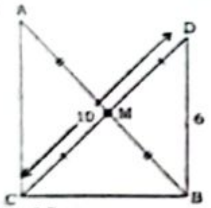
(3 + 4 + 7) unit = 129°

7 unit = $\dfrac{129°}{14} \times 7 = 64.5°$

Angle = 64.5° + 17° = 81.5°

In radian → $81.5° \times \dfrac{\pi}{180°} = \dfrac{163\pi}{360}$

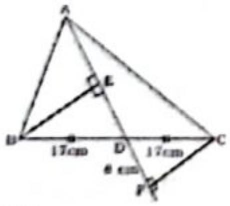
591. (b)



CD = 10 cm

$DM = CM \Rightarrow CM = \dfrac{CD}{2} = \dfrac{10}{2} = 5$ cm

592. (b)

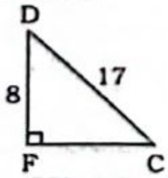


Given,

BC = 34

BD = DC = 17 (∵ Median AD bisect side BC into two equal parts)

In ΔDFC:



$\Rightarrow FC^2 = DC^2 - DF^2 \Rightarrow FC^2 = 17^2 - 8^2$

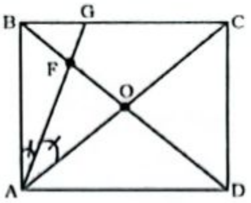
$\Rightarrow FC^2 = 15^2 \Rightarrow FC = 15$

∵ ∠CFD = ∠BED and BD = CD

ΔCDF ≅ ΔBDE (RHS)

∴ CF = BE = 15

593. (a)



Let, the side of square be 2a

$AC = 2\sqrt{2}a$

In ΔABC,

By angle bisector theorem,

$\dfrac{AC}{AB} = \dfrac{CG}{BG}$

$\Rightarrow \dfrac{2\sqrt{2}a}{2a} = \dfrac{CG}{BG} \Rightarrow \dfrac{\sqrt{2}}{1} = \dfrac{CG}{BG}$

$\Rightarrow BG = \dfrac{CG}{\sqrt{2}}$

In ΔAOB,

By angle bisector theorem,

$\dfrac{AO}{AB} = \dfrac{OF}{BF}$

$\Rightarrow \dfrac{a\sqrt{2}}{2a} = \dfrac{OF}{BF} \Rightarrow \dfrac{OF}{BF} = \dfrac{1}{\sqrt{2}}$

$\Rightarrow BF = \sqrt{2}OF$

$BF + OF = OB \Rightarrow \sqrt{2}\,OF + OF = \sqrt{2}a$

$\Rightarrow OF = \dfrac{a\sqrt{2}}{(\sqrt{2}+1)}$

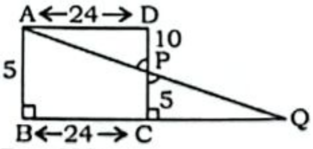
$BC = BG + CG \Rightarrow 2a = \dfrac{CG}{\sqrt{2}} + CG$

$\Rightarrow CG = \dfrac{2\sqrt{2}a}{\sqrt{2}+1}$

$OF : CG = \dfrac{a\sqrt{2}}{(\sqrt{2}+1)} : \dfrac{2\sqrt{2}a}{\sqrt{2}+1}$

= 1 : 2

594. (a)



∠APD = ∠CPQ

(Vertically opposite angle)

∠ADP = ∠QCP = 90°

ΔCQP ~ ΔDAP

$\dfrac{CP}{PD} = \dfrac{CQ}{AD} \Rightarrow \dfrac{5}{10} = \dfrac{CQ}{AD}$

$\Rightarrow CQ = \dfrac{1}{2}AD = \dfrac{1}{2} \times 24 = 12$

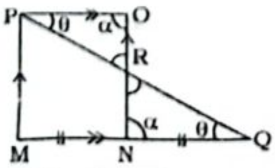
∴ BQ = 24 + 12 = 36

By using triplet

(5, 12, 13) × 3 = (15, 36, 39)

∴ AQ = 39 cm

595. (d)



In ΔQRN and ΔPOR,

∠Q = ∠P = (Alternate angle)

∠QRN = ∠PRO and PO = MN

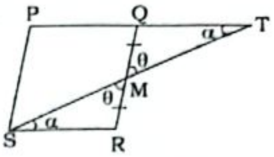
= NQ

∴ ΔQRN ≅ ΔPOR

OR = RN (opposite side of equal angle)

∴ OR : RN = 1 : 1

596. (c)



ΔSMR and ΔTMQ are congruent triangles (ASA)

$\dfrac{QM}{MR} = \dfrac{QT}{SR}$ [∵ QM = MR]

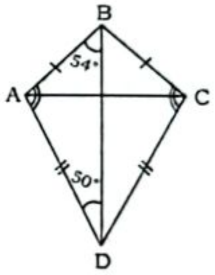
⇒ QT = SR

∵ PQ = SR = QT

∴ PT = 2SR

597. (b) In ΔBAD,

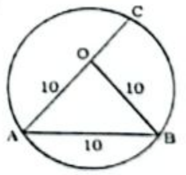
∠BAD = 180° − 54° − 50° = 76°



ΔABD and ΔCBD are congruent

∴ ∠BAD = ∠BCD = 76°

598. (c)

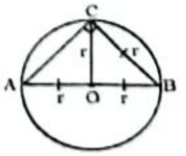


OA = 10 = AB = OB

⇒ AOB is an equilateral triangle.

∴ ∠AOB = 60°

599. (b)



OB = OC = BC = r

ΔOBC is equilateral triangle

Now,

∠BCO = 60°, ∠CBO = 60°

∠ACB = 90° (Angle made in semi circle)

∠BAC = 180 − 90 − 60 = 30°

Then,

∠ABC = x∠BAC

$\Rightarrow 60° = x \times 30° \Rightarrow x = 2$

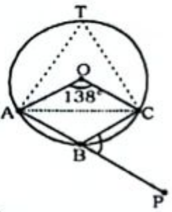
Alternate Method:-

Given, OB = BC
and ∠ABC = x∠BAC.
Since, AB is Diameter
⇒ ∠ACB = 90° (angle made in semi circle is always 90°)
⇒ ∠BAC + x∠BAC = 90° .... (i)
In ΔACB,

$$\sin\theta = \frac{p}{h} = \frac{1}{2} = \text{Sin}30°$$

⇒ θ = 30°
⇒ ∠ABC = 60° (From (i))
⇒ x = 2

600. (d)



ATQ,

$$\angle ATC = \frac{138}{2} = 69°$$

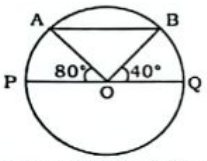
∠ATC = ∠CBP = 69°(alternate segment theorem)

Alternate Method:-

$$\angle ABC = 180° - \frac{138°}{2}$$

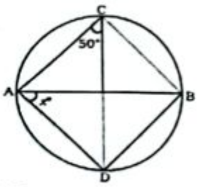
= 180° – 69° = 111°
Now,
∠CBP = 180° – 111° = 69°

601. (b)



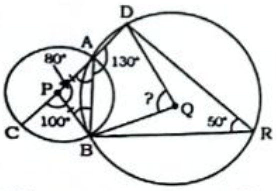
∠AOB = 180° – 80° – 40° = 60°
(Linear angles is always 180°)

602. (a)



ATQ,
AB is a diameter of the circle
So, ∠ACB = 90° (Angle in semicircle)
then, ∠DCB = 90° – 50° = 40°
then, ∠DAB = ∠DCB = 40° (Angle subtended by arc DB)
∴ x = 40°

603. (b)

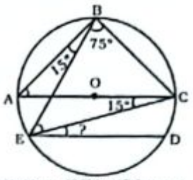


∠APB = 180° – 100° = 80°
Now, in ΔAPB,
AP = PB = radius of the smaller circle
So, ∠PAB = ∠PBA

$$= \left[\frac{180° - 80°}{2}\right] = 50°$$

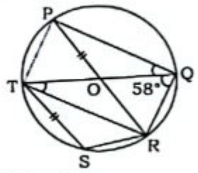
Now, ∠DAB = 180° – 50° = 130°
As ABRD is a cyclic quadrilateral
So, ∠BRD = 180° – 130° = 50°
∴ ∠BQD (x) = 50° × 2 = 100°

604. (c)



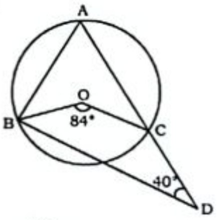
∠EBC = 75° (Given)
∴ If we join AB then ∠ABC = 90°
[Angle made by diameter at circumference is 90°]
⇒ ∠ABE = 90° – ∠EBC = 15°
∠ABE = ∠ACE = 15° [Angles made by the same arc]
Now, Since AC | | ED
⇒ ∠ACE = ∠CED [Alternate interior Angles]
⇒ ∠CED = 15°

605. (d)



∠PQR = 90°
(Angle formed by diameter)
Also, ∠PQT = 90° – 58° = 32°
∠PQT = ∠PRT = 32° (by arc PT)
Given, TS | | PR
∴∠PRT = ∠RTS = 32°
(Alternate interior angles)

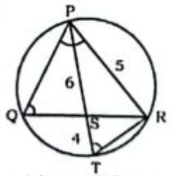
606. (d)



$$\angle A = \frac{84}{2} = 42°$$

In ΔABD,
∠ABD = 180° – (42° + 40°) = 98°

607. (b)



Consider, ΔPQS and ΔPTR
∠QPS = ∠TPR
∠PQR = ∠PTR
(Angles formed by same arc.)
⇒ ΔPQS ~ ΔPTR

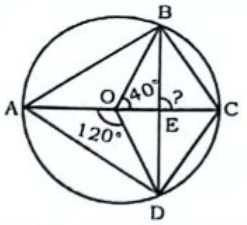
$$\Rightarrow \frac{PS}{PR} = \frac{PQ}{PT} \Rightarrow \frac{6}{5} = \frac{PQ}{10}$$

⇒ PQ = 12 cm

Alternate Method:

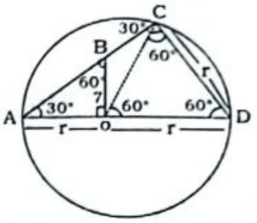
PT² = PQ × PR + PT × ST
⇒ 10² = PQ × 5 + 10 × 4
⇒ 100 = 5PQ + 40 ⇒ 5PQ = 60
⇒ PQ = 12 cm.

608. (c)



∠DOE = 180° – 120° = 60°
(Linear angle)
∠DOB = 60° + 40° = 100°
OB = OD (Radius)
⇒ ∠OBE = ∠ODE = 40°
∴ ∠BEC = ∠EOB + ∠OBE
(exterior angle property)
= 40° + 40° = 80°

609. (c)



In a right angle triangle ACD
AD² = DC² + AC²
⇒ AC² = (2r)² – r²
⇒ AC = $r\sqrt{3}$

$$\text{In } \Delta AOB, \tan 30° = \frac{7}{r}$$

⇒ r = $7\sqrt{3}$ cm

$$\sin 30° = \frac{7}{AB} \Rightarrow AB = 14 \text{ cm}$$

∵ AC = $r\sqrt{3}$
∴ AC = $7\sqrt{3} \times \sqrt{3}$ = 21 cm
∴ BC = AC – AB = 21 – 14 = 7 cm

Alternate Method:

I. ∠ACD = 90°
(angle made by diameter)
∠COD = 60° (given)
⇒ ∠DAC = 30°
[Angle circumference is half the angle at centre]
∠ABO = 60°
∴ InΔABO : –∠BOA = 90°
Hence, ∠BOC = 180° – (60° + 90°) = 30°
Also, ∠OCB = 90° – 60° = 30°

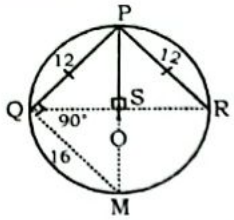
∴ InΔOBC ,
OB = BC [Sides opposite to equal angles are equal]
⇒ BC = 7cm

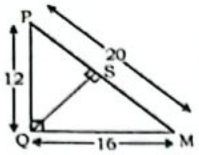
II. Since, OC = OD (Radius)

$$\therefore \angle ODC = \angle OCD = \frac{180° - 60°}{2} = 60°$$

Also, ∠ACD = 90°
(angle made by diameter)
⇒ ∠BCO = 90° – 60° = 30°
∠OBC = 180° – 60° = 120°
∴ In ΔOBC,
∠BOC = 180° – (120° + 30°) = 30°
Hence, ΔOBC is an isosceles Δ
∴ OB = BC = 7cm.

610. (a)



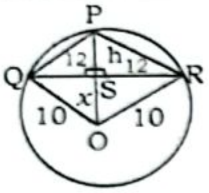


∠PQM = 90° (Angle in semi-circle)
QS = SR (In isosceles Δ, median, incenter, circumcenter are collinear)
∠PSR = ∠PSQ = 90° (Isosceles Δ)
PM = 20cm (Diameter)
QM = 16 cm (triplets of 12, 16, 20)

$$PS = \frac{PQ^2}{PM} = \frac{12 \times 12}{20} = 7.2$$

$\therefore$ OS = 10 − 7.2 = 2.8 cm

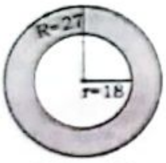
Alternate Method:



$$h = \frac{ab}{2r} = \frac{12 \times 12}{2 \times 10}$$

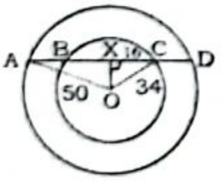
= 7.2 (Result)
$h + x = 10$
$\Rightarrow 7.2 + x = 10$
$\Rightarrow x = 2.8$ cm

611. (a)



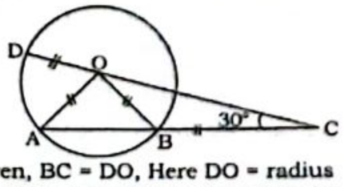
Area of closed figure = $\pi R^2 - \pi r^2$
$= \pi(27^2 - 18^2)$
$= \pi(27 + 18)(27 - 18)$
$= 45 \times 9\pi = 405\pi$

612. (b)



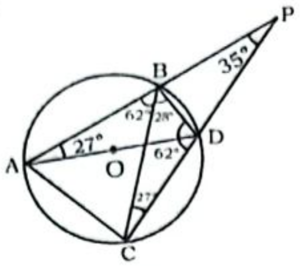
using triplet = (8, 15, 17)
↓ ↓ ↓
16 30 34
OX = 30 (using triplet)
$AX^2 = 50^2 - 30^2$
$\Rightarrow AX = \sqrt{2500 - 900} = \sqrt{1600} = 40$
$\therefore$ AD = 2 × AX = 2 × 40 = 80 cm

613. (b)



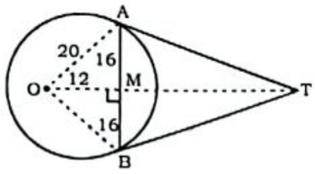
Given, BC = DO, Here DO = radius
So, DO = AO = OB (radius of circle)
Since, ∠BCO = 30°, then, ∠BOC = 30° [$\because$ BC = BO]
Then, ∠OBA = ∠BCO + ∠BOC [Exterior angle]
∠OBA = 30° + 30° = 60° [$\because$ AO = OB]
SO, ∠AOB = 180° − 120° = 60°
$\therefore$ ∠AOD = 180° − (∠AOB + ∠BOC)
= 180° − (60° + 30°) = 90°

614. (c)



Given, ∠BAD = 27°
⇒ ∠DCB = 27° [Angles in same segment by same chord are equal.]
In ΔAPD, ∠DAP + ∠APD = ∠ADC
($\because$ Exterior angle)
⇒ 35° + 27° = ∠ADC
∠ADC = 62°
∠ABC = ∠ADC = 62°
In ΔABD
∠ABD = 90°
[$\because$ Angle formed by diameter]
∠DBC = 90° − 62° = 28°

615. (c)



We know,
ΔOMA ~ ΔOAT

$$\Rightarrow \frac{TA}{16} = \frac{20}{12}$$

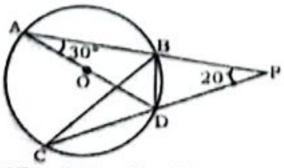
$$\Rightarrow TA = \frac{80}{3} = 26.67 \text{ cm}$$

Alternate Method:-

$$PA = PB = \frac{ar}{\sqrt{r^2 - a^2}} = \frac{16 \times 20}{\sqrt{20^2 - 16^2}}$$

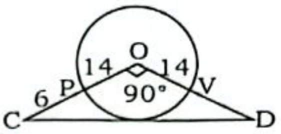
$$= \frac{320}{12} = \frac{80}{3} = 26.67 \text{ cm}$$

616. (d)



∠BAD = 30°, ∠P = 20°
∠ABD = 90° (Angle made by dimater at the circumference of circle is always 90°)
∠BCD = 30° (Angle made by same arc)
∠ABC = 30° + 20° = 50°(Exterior angle)
∠DBC = 90° − 50 = 40°

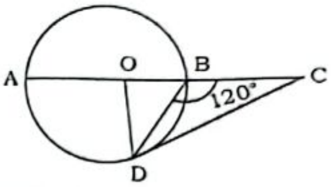
617. (b)



$2\pi r = 88 \Rightarrow 2 \times \frac{22}{7} \times r = 88 \Rightarrow r$
= 14 cm
ATQ,
OC = 6 + 14 = 20 cm
OD = OC + 1 = 20 + 1 = 21 cm
In right angle ΔOCD,
CD = 29 cm (triplet of 20, 21, 29)

$\therefore$ Half of CD = $\frac{29}{2}$ = 14.5 cm

618. (c)

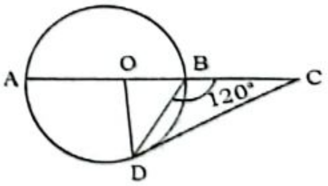


∠DBC = 120° (Given)
∠OBD = 180° − 120° = 60° (Linear angle)
∠ODC = 90°
OB = OD = 6 cm (Radius)
⇒ OBD is an equilateral triangle.
$\therefore$ OB = OD = BD = 6 cm
∠BDC = 90° − 60° = 30°
∠BCD = 180° − 120° − 30° = 30°

By Sine rule, $\frac{\sin 120°}{DC} = \frac{\sin 30°}{BD}$

$$\Rightarrow \frac{\sqrt{3}}{2DC} = \frac{1}{2 \times 6} \Rightarrow DC = 6\sqrt{3} \text{ cm}$$

Alternate Method:



∠DBC = 120° (Given)
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⇒ OBD is an equilateral triangle.
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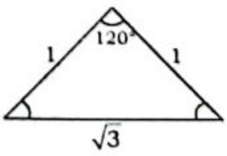
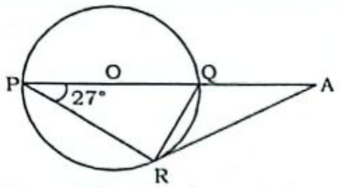
∠BDC = 90° − 60° = 30°
∠BCD = 180° − 120° − 30° = 30°



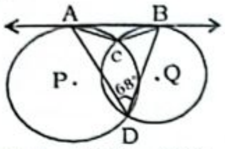
$\therefore$ DC = $6\sqrt{3}$ cm

619. (a)



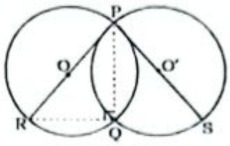
∠PRQ = 90° (Angle made by the diameter at the circumference of the circle is always 90°)
In ΔPQR,
27° + 90° + ∠PQR = 180°(Sum of angle of a triangle is always 180°)
∠PQR = 180° – 117° = 63°

620. (b)



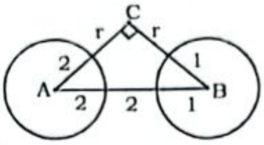
∠ADB + ∠ACB = 180°
⇒ 68° + ∠ACB = 180°
⇒ ∠ACB = 180° – 68° = 112°

621.(a)



In O centre circle, angle made on the circumference of the semi-circle is always 90°
∴ ∠PQR = 90°

622.(b) Let, Radius = r cm



By pythagoras theorem,
$AB^2 = AC^2 + BC^2$
$(5)^2 = (2 + r)^2 + (1 + r)^2$
$\Rightarrow 25 = 4 + r^2 + 4r + 1 + r^2 + 2r$
$\Rightarrow 20 = 2r^2 + 6r$
$\Rightarrow r^2 + 3r - 10 = 0$
$\Rightarrow r^2 + 5r - 2r - 10 = 0$
$\Rightarrow (r + 5)(r - 2) = 0$
$\Rightarrow r = -5, 2$
∴ Radius can't be negative so, 2 cm will be value of r.

Alternate Method:

$(5)^2 = (2 + r)^2 + (1 + r)^2$
By value putting method option (b)
$r = 2$
$\Rightarrow (5)^2 = (2 + 2)^2 + (1 + 2)^2$
$\Rightarrow 25 = 16 + 9$

$\boxed{25 = 25}$

⇒ LHS = R.H.S
∴ r = 2 cm

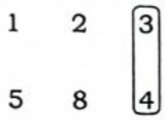
SMART APPROACH:-
H = 5 with the help of triplet 3, 4, 5
∴ r = 2

SPEED BOOSTER HACKS

◆ Three Digit Multiplication Trick ◆

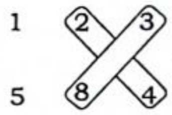
$$\begin{array}{r} 1\ 2\ 3 \\ \times\ \underline{5\ 8\ 4} \end{array}$$

Step I:



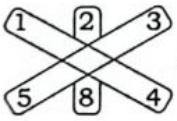
= 12, we will write 2 & 1 will be taken as carry

Step II:



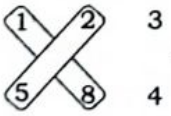
= 2 × 4 + 8 × 3 + **1** = 33 we will write 3 & 3 will be taken as carry

Step III:



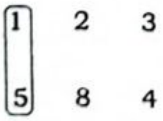
= 1 × 4 + 5 × 3 + 2 × 8 + **3** = 38 we will write 8 & 3 will be taken as carry

Step IV:



= 1 × 8 + 2 × 5 + **3** = 21 we will write 1 & 2 will be taken as carry

Step V:



= 5 + **2** = 7

Hence, 123 × 584 = 71832

◆ Do it Yourself ◆

$$\begin{array}{r} 3\ 4\ 5 \\ \times\ \underline{2\ 4\ 7} \end{array} \qquad \begin{array}{r} 9\ 3\ 5 \\ \times\ \underline{6\ 1\ 7} \end{array}$$

$$\begin{array}{r} 3\ 7\ 5 \\ \times\ \underline{8\ 4\ 3} \end{array} \qquad \begin{array}{r} 3\ 4\ 5 \\ \times\ \underline{5\ 4\ 3} \end{array}$$

$$\begin{array}{r} 9\ 3\ 2 \\ \times\ \underline{2\ 4\ 7} \end{array} \qquad \begin{array}{r} 3\ 4\ 7 \\ \times\ \underline{8\ 3\ 2} \end{array}$$

$$\begin{array}{r} 1\ 4\ 0 \\ \times\ \underline{2\ 4\ 5} \end{array} \qquad \begin{array}{r} 7\ 8\ 9 \\ \times\ \underline{6\ 4\ 7} \end{array}$$

$$\begin{array}{r} 6\ 6\ 1 \\ \times\ \underline{2\ 5\ 7} \end{array} \qquad \begin{array}{r} 7\ 8\ 8 \\ \times\ \underline{2\ 3\ 4} \end{array}$$

25

Chapter

CO-ORDINATE GEOMETRY

◆ TYPE – I ◆
BASIC QUESTIONS

1. Which of the following is the Co-ordinate of the origin?
(a) $(0, x)$ (b) $(x, 0)$
(c) $(0, 0)$ (d) (x, x)

2. What is ordinate of point A(5, 6)?
(a) 2 (b) 5
(c) 3 (d) 6

3. What is abscissa of point A(2, 3)?
(a) 2 (b) 5
(c) 3 (d) 1

4. What is the difference of the abscissa and ordinate of the point P(7, –3)?
(a) 4 (b) –7
(c) –4 (d) 10

5. The ordinate and abscissa of the point (k, 2k – 1) be equal, The value of k is ?
(a) 0 (b) –1
(c) 1 (d) 0.5

6. The point (–2, 4) lies in which quadrant?
(a) 1st (b) 2nd
(c) 3rd (d) 4th

7. What is the polar co-ordinate of $(1, \sqrt{3})$
(a) (2cos60°, 2sin60°)
(b) (2cos30°, 2sin30°)
(c) (2sin60°, 2cos60°)
(d) (2sin30°, 2cos30°)

◆ TYPE – II ◆
DISTANCE FORMULA

8. Find the distance between points A(3, –7) & B(–5, 8)
(a) 12 (b) 17
(c) 13 (d) 14

9. Find the value of x, if the distance between the points $(x, -1)$ and (3, 2) is 5 cm.
(a) 2 (b) 7
(c) 3 (d) 4

◆ TYPE – III ◆
MID POINT FORMULA

10. If the mid-point of joining (-8, 13) and (k, 7) is (4, 10) then find the value of k ?
(a) 11 (b) 17
(c) 14 (d) 16

◆ TYPE – IV ◆
SECTION FORMULA

11. Find the coordinates of the point which divides the line segment joining the points (2, –3) and (–4, 6) in the ratio 1 : 2 internally.
(a) (8, 0) (b) (0, 0)
(c) (3, –5) (d) (4, 3)

12. In which ratio point P(1, 2) divides the line segment joining (–2, 1) and (7, 4)
(a) 1 : 2 (b) 2 : 1
(c) 3 : 2 (d) 2 : 3

13. Find the coordinates of the point which divides the line segment joining the points (2, 1) and (3, 5) externally in the ratio 2 : 3.
(a) (0, –6) (b) (0, 0)
(c) (3, –5) (d) (0, –7)

◆ TYPE – V ◆
SLOP OF A LINE

14. Find the slope of a line which passes through (4, 2) and (7, 6).
(a) $\frac{4}{3}$ (b) $\frac{3}{4}$
(c) $\frac{3}{2}$ (d) $\frac{2}{3}$

15. The length of the portion of the straight line $5x + 12y = 60$ intercepted between the axes is:
SSC CHSL 03/07/2024 (Shift-01)
(a) 5 (b) 13
(c) 17 (d) 12

16. The shortest length of the intercept between the x-axis and y-axis of the equation $6x + 8y - 48 = 0$ is:
SSC CHSL 02/07/2024 (Shift-03)
(a) 10 units (b) 6 units
(c) 14 units (d) 12 units

17. If the graph of the equation $20x + 21y = 420$ cuts the coordinate axes at P and Q, then what is the measure of the length (in units) of PQ?
SSC CHSL 05/07/2024 (Shift-04)
(a) 25 (b) 29
(c) 40 (d) 35

18. Find the length of the x-intercept made by the line $12x - 9y - 108 = 0$ between the coordinate axis.
(a) 9 unit (b) 12 unit
(c) 15 unit (d) 18 unit

19. Find the equation of a line whose slope is 5 and y intercept is 12.
(a) $y - 5x - 12 = 0$
(b) $y + 5x + 12 = 0$
(c) $5x - y - 12 = 0$
(d) $3x + y - 15 = 0$

20. Find the equation of a line whose slope is –3 and it passes through point (2, –5).
(a) $3x + y - 1 = 0$
(b) $x + 3y - 1 = 0$
(c) $3x + y + 1 = 0$
(d) $x + 3y + 1 = 0$

21. Find the equation of a line whose slope is $\frac{2}{3}$ and it passes through point (–3, 5).
(a) $2x - 3y = -21$
(b) $2x - 3y = 21$
(c) $3x - 2y = 21$
(d) $2x + 3y = 21$

22. Find the equation of a line passing through points (-1, 5) and (2, 7)
(a) $2x - 3y - 17 = 0$
(b) $2x + 3y - 17 = 0$
(c) $2x + 3y + 17 = 0$
(d) $2x - 3y + 17 = 0$

23. Find the equation of a line passing through points (2, 3) and mid-point of the line whose end points are (4, 9) & (6, 5).
(a) $3y + 4x = 1$ (b) $4x - 3y = -1$
(c) $3x + 4y = 1$ (d) $3x - 4y = 1$

24. Find the equation of a line whose x and y intercepts are 5 & 4
(a) $4x + 5y - 20 = 0$
(b) $5x + 4y - 20 = 0$
(c) $4x - 5y - 20 = 0$
(d) $4x + 5y + 20 = 0$

◆ TYPE – VI ◆
POINT OF INTERSECTION OF TWO LINES

25. If the intersection point of the equations $3p - 2q + 23 = 0$ and $-2p + q - 13 = 0$ on the graph is (p, q), then the value of $(3p + q)$ is equal to:
SSC CHSL 09/07/2024 (Shift-02)
(a) 2 (b) 1
(c) –2 (d) –1

26. If the point of Intersection of lines $x + y = 2$ and $2x - y = 1$ lies on $y = Kx + 5$, what is the value of K?
SSC CHSL 02/07/2024 (Shift-04)
(a) 3 (b) –4
(c) 4 (d) –3

27. If equation of line p is $x + y = 5$ and that of line q is $x - y = 3$, what are the coordinates of the point common to both the lines?

SSC CHSL 01/07/2024 (Shift-01)

(a) (2, 1) (b) (1, 4)
(c) (2, 3) (d) (4, 1)

28. Two graphs of the equations $3x + y - 5 = 0$ and $2x - y - 5 = 0$ intersect at the point P(a, b). What is the value of (3a + b)?

SSC CGL TIER-II 11/09/2019

(a) 4 (b) – 4
(c) 3 (d) 5

29. The graphs of the equations $x - 7y = -42$ intersects the y-axis at P(a, b) and the graph of the $6x + y - 15 = 0$ intersects the x-axis at Q(g, d). What is the value of a + b + g + d?

SSC CGL TIER-II 11/09/2019

(a) 8.5 (b) 6
(c) 4.5 (d) 5

30. The point of intersection of the graphs of the equation $3x - 5y = 19$ and $3y - 7x + 1 = 0$ is P(a, b). What is the value of (3a – b)?

SSC CGL TIER-II 12/09/2019

(a) – 2 (b) – 1
(c) 1 (d) 0

31. The graph of the equation $3x - 20y - 2 = 0$ and $11x - 5y + 61 = 0$ intersect at P(a, b). What is the value of $\frac{a^2+b^2-ab}{a^2-b^2+ab}$

SSC CGL TIER-II 15/11/ 2020

(a) $\frac{37}{35}$ (b) $\frac{31}{41}$
(c) $\frac{5}{7}$ (d) $\frac{41}{31}$

32. The graph of the linear equation $4x - 2y = 10$ and $4x + ky = 2$ intersect at point (a, 4). The value of k is equal to:

SSC CGL TIER-II 18/11/ 2020

(a) 3 (b) – 3
(c) – 4 (d) 4

◆ TYPE – VII ◆
ANGLE BETWEEN TWO LINES

33. Find the acute angle between the lines $y = 2x + 5$ and $y + 3x + 2 = 0$

(a) 30° (b) 45°
(c) 60° (d) 75°

◆ TYPE – VIII ◆
DISTANCE OF A POINT FROM A LINE

34. Find the distance of point (–5, 8) from line $3x + 4y - 12 = 0$.

(a) 1 (b) 2
(c) 3 (d) 4

35. The perpendicular length from the origin to the line $6x + 8y - 48 = 0$ is:

SSC CHSL 05/07/2024 (Shift-03)

(a) 2.6 unit (b) 4.8 unit
(c) 8.3 unit (d) 5.2 unit

36. Find the perpendicular distance of line $3x + 4y + 7 = 0$ from origin.

(a) $\frac{3}{5}$ (b) $\frac{2}{5}$
(c) $\frac{7}{5}$ (d) $\frac{7}{4}$

◆ TYPE – IX ◆
TRIANGLE

37. If three vertices of a triangle are (6, 7), (1, 2) and (–5, 8), the triangle is

(a) Acute-angled
(b) Right angled
(c) Obtuse angled
(d) None of these

38. If three vertices of a triangle are (4, 0), (0, 0) and (–3, 4), the triangle is

(a) Acute-angled
(b) Right angled
(c) Obtuse angled
(d) None of these

39. Find the value of 'a' for which the points :(1, 2), (3, 4) and (5 , – a) are collinear.

(a) – 6 (b) – 4
(c) – 1 (d) – 2

40. What is the area (in square units) of the triangular region enclosed by the graphs of the equation $x + y = 3$, $2x + 5y = 12$ and the x-axis?

SSC CGL TIER-II 13/09/2019

(a) 2 sq. units (b) 3 sq. units
(c) 4 sq. units (d) 6 sq. units

41. What is the area of the region created by the two linear equations $2x + y = 6$ and $2x - y = -2$ bounded by these lines and the x-axis?

SSC CHSL 03/07/2024 (Shift-02)

(a) 5 units² (b) 8 units²
(c) 3 units² (d) 6 units²

42. Find the area of a triangle whose vertices are A (2, 4), B (0, 0) and C (–3, 6).

(a) 06 sq. units (b) 12 sq. units
(c) 18 sq. units (d) 24 sq. units

43. Find the area of triangle bounded by x-axis, y-axis and $3x + 4y - 12 = 0$

(a) 6 units² (b) 12 units²
(c) 16 units² (d) 14 units²

44. The area in (sq. units) of the triangle formed by the graphs of $8x + 3y = 24$, $2x + 8 = y$ and the x-axis is?

SSC CGL TIER-II 15/11/2020

(a) 28 units² (b) 14 units²
(c) 15 units² (d) 24 units²

45. Find the co-ordinate of the centroid of a triangle, whose vertices are (2,–2), (6, –3) and (4, 2)

(a) (4, –7) (b) (0, 7)
(c) (4, –1) (d) (0, –1)

46. Find the incentre of a triangle ABC whose vertices are A(0, 0),B(5, 0) and C(0, 12).

(a) (2, –2) (b) (3, –2)
(c) (3, 2) (d) (2, 2)

47. The co-ordinates of the vertices of a right-triangle are P(3, 4), Q(7, 4) and R (3, 8), right-angle being at P. The co-ordinate of the ortho centre of triangle PQR.

(a) (7, 4) (b) (3, 8)
(c) (5, 6) (d) (3, 4)

48. The co-ordinates of the vertices of a right-triangle are P(3, 4), Q(7, 4) and R (3, 8), right-angled at P. The co-ordinate of the circum centre of triangle PQR.

(a) (7, 4) (b) (3, 8)
(c) (5, 6) (d) (3, 4)

49. Find the ortho centre of an equilateral ΔPQR, whose vertices are P(2, –3), Q(0, –3) and R(4, 9).

(a) (2, 1) (b) (3, –2)
(c) (3, 2) (d) (1, 2)

◆ TYPE – X ◆
MIRROR / REFLECTION

50. What is the reflection of the point (5, –3) in the line Y = 3?

SSC CGL 2019 TIER-II 18/11/2020

(a) (5, – 6) (b) (– 5, 3)
(c) (5, 9) (d) (5, 3)

51. Find the reflection of point A(5, 4) on x-axis.

(a) (5, 4) (b) (5, –4)
(c) (4, 5) (d) (–4, 5)

52. Find the reflection of point A(5, 4) on y-axis.

(a) (5, 4) (b) (5, –4)
(c) (–5, 4) (d) (–4, 5)

◆ TYPE – XI ◆
CIRCLE

53. If a circle whose centre is (2, 3) touches the line $4x + 3y - 7 = 0$, then the radius of the circle is:

SSC CHSL 03/07/2024 (Shift-01)

(a) 4 unit (b) 1 unit
(c) 2 unit (d) 3 unit

54. The equation of circle with centre (1, 2) and radius 4 cm is :

SSC CHSL 17/03/2020 (Shift-02)

(a) $x^2 + y^2 + 2x - 4y = 16$
(b) $x^2 + y^2 - 2x + 4y = 16$
(c) $x^2 + y^2 + 2x - 4y = 11$
(d) $x^2 + y^2 - 2x - 4y = 11$

55. If $x^2 + y^2 + 6x + 8y + 11 = 0$ is the equation of a circle, find its centre and radius.

(a) (–3, – 4), $\sqrt{14}$ (b) (– 5, 3),8
(c) (5, 9),7 (d) (5, 3),9

56. Find the equation of the sphere having centre (–1, 2, –3) and the radius of 3 units.

SSC CHSL 09/07/2024 (Shift-03)

(a) $x^2 + y^2 + z^2 - 2x + 4y - 6z + 5 = 0$
(b) $x^2 + y^2 + z^2 + x - 2y + 3z + 5 = 0$
(c) $x^2 + y^2 + z^2 + 2x - 4y + 6z + 5 = 0$
(d) $x^2 + y^2 + z^2 - x + 2y - 3z + 5 = 0$

◆ TYPE – XII ◆
SYSTEM OF EQUATIONS

57. Find the value of 'k' for which the system of equations $4x + 6y = 7$ and $6x + (k + 4)y - 21 = 0$ has a unique solution.

SSC CGL 25/09/2024 (Shift-02)

(a) $k = 5$ (b) $k \neq 5$

(c) $k = 7$ (d) $k \neq 7$

58. The relation between K_1 and K_2 for which the system of linear equations $K_1x + 3y = 8$ and $4x + K_2y = 16$ represents coincident lines, is:

SSC CGL 25/09/2024 (Shift-02)

(a) $K_2 = 3K_1$ (b) $K_2 + 3K_1 = 0$

(c) $K_2 = K_1$ (d) $K_1 + K_2 = 0$

59. Given a linear equation in two variables: $5x + 7y - 8 = 0$, which of the following linear equations, along with the given equation, forms a system of linear equations having no solution?

SSC CGL 26/09/2024 (Shift-01)

(a) $5x + 7y - 16 = 0$

(b) $7x + 5y - 8 = 0$

(c) $5x - 7y - 8 = 0$

(d) $10x + 14y - 16 = 0$

60. If the equations $4x + (k - 2)y + 3 = 0$ and $(k - 2)x + 9y - 5 = 0$ $(k > 0)$ are parallel, then find the value of $k^2 + 6$.

SSC CGL 09/09/2024 (Shift-03)

(a) 68 (b) 70

(c) 72 (d) 64

61. Find the values of x, y and z, so as to satisfy the equations given below:
$x + y + z = 12; x + y - z = 6; x - y + z = 4$

SSC CGL 10/09/2024 (Shift-02)

(a) $x = 5, y = 4, z = -3$

(b) $x = 5, y = -4, z = 3$

(c) $x = 5, y = 4, z = 3$

(d) $x = 5, y = -4, z = -3$

62. For what value of k will the lines $2x + 7ky - 8 = 0$ and $x + y - 9 = 0$ have no solution?

SSC CGL 10/09/2024 (Shift-03)

(a) $\frac{2}{7}$ (b) $\frac{9}{7}$

(c) $\frac{8}{9}$ (d) $\frac{1}{2}$

63. Solve the given set of three equations to get the value of the unknowns:

$x + 2z = 3$

$x + 2y + 3z = 5$

$3x - 5z = -13$

SSC CGL 11/09/2024 (Shift-01)

(a) $x = 0, y = -1, z = 2$

(b) $x = -1, y = 0, z = 2$

(c) $x = -1, y = 2, z = 0$

(d) $x = 2, y = 0, z = -1$

64. If $0.4x + 0.16y = 1.7$ and $0.3x + 0.12y = 3.4$, then which of the following is correct?

SSC CGL 11/09/2024 (Shift-02)

(a) The system has finitely many solutions but not unique

(b) The system has infinitely many solutions

(c) The system has no solution

(d) The system has unique solution

65. For the following equations, what are the values of a and b to have infinitely many solutions?

$ax + by = 2$

$3x - (5 - 2a)y = 6$

SSC CGL 12/09/2024 (Shift-02)

(a) $a = -1, b = -1$

(b) $a = -1, b = 1$

(c) $a = 1, b = -1$

(d) $a = 1, b = 1$

66. Which of the following is the sum of the values of a and b if the equations $2x + y = a$, $8x + by = 12$ have infinite solutions?

SSC CGL 12/09/2024 (Shift-03)

(a) 16 (b) 9

(c) 7 (d) 18

67. Find the values of x, y and z, so as to satisfy the equations given below:
$5x - 3y + 7z = 22; 3x - 5y - 2z = -46;$
$2x - 2y + 5z = 24$

SSC CGL 12/09/2024 (Shift-03)

(a) $x = -5, y = 3, z = -8$

(b) $x = 5, y = -8, z = 8$

(c) $x = -5, y = 3, z = 8$

(d) $x = -5, = -3, z = 8$

68. The solution of the following equations is:

$5x + 4y - 8z = 1$

$7x - 9y + z = -1$

$2x + 3y - 4z = 1$

SSC CGL 13/09/2024 (Shift-01)

(a) $x = -1, y = 1, z = 1$

(b) $x = 1, y = 1, z = 1$

(c) $x = 1, y = -1, z = 1$

(d) $x = 1, y = 1, z = -1$

69. For which of the following values of a and b do the given equations, have NO solution?

$x - ay = 2 - a$

$(1 - a)x + 6y = a + b$

SSC CGL 13/09/2024 (Shift-02)

(a) $a = 3, b \neq 1$ (b) $a = 3, b \neq -1$

(c) $a = -3, b \neq -1$ (d) $a = -3, b \neq 1$

70. For what value of k, the system of equations $kx - 15y + 7 = 0$ and $7x - 21y - 19 = 0$ has no solution?

SSC CGL 17/09/2024 (Shift-01)

(a) 5 (b) 12

(c) 25 (d) 6

71. For what value of k, the system of equations $4x + 12y + 36 = 0$ and $5x + ky + 45 = 0$ has an infinite number of solutions?

SSC CGL 17/09/2024 (Shift-02)

(a) 20 (b) 25

(c) 22 (d) 15

72. For the equations $ax + (a^2 + 1)y = 4$ and $4x + ay = a^2$, which of the following statements is TRUE?

SSC CGL 19/09/2024 (Shift-03)

(a) If $a = 6$, then $x = \frac{325}{28}, y = -\frac{25}{28}$ are the solutions

(b) If $a = 6$, then $x = 48, y = 4$ are the solutions

(c) If $a = -12$, then $x = \frac{325}{28}, y = -\frac{25}{28}$ are the solutions

(d) If $a = -12$, then $x = 48, y = 4$ are the solutions

73. What conclusion can be drawn about the solution of the following system of linear equations in two variables:

$3x + 2y = 7$

$2x + 3y = 7$

SSC CGL 24/09/2024 (Shift-01)

(a) No solution

(b) Unique solution

(c) Infinite solutions

(d) More than two solution

74. For what value of K does the following system have an infinite number of solutions?

$x + 2Ky - 8 = 0$

$2x - y - 16 = 0$

SSC CGL 24/09/2024 (Shift-02)

(a) 4 (b) $-\frac{1}{4}$

(c) 2 (d) $-\frac{1}{2}$

75. Find the values of 'a' and 'b' for which the system of equations $3x + y = 3$ and $(a - b)x + (a + b)y = 3a + b - 3$ has infinite solutions.

SSC CGL 25/09/2024 (Shift-01)

(a) $a = 3, b = -\frac{2}{3}$

(b) $a = -\frac{3}{2}, b = 2$

(c) $a = 3, b = -\frac{3}{2}$

(d) $a = 2, b = -\frac{3}{2}$

76. Find the value of the unknowns:

$x + 1.5y + 2z = 5.5$

$x + 5y + 7z = 15$

$3x + 11y + 13z = 25$

SSC CGL 26/09/2024 (Shift-03)

(a) $x = 2, y = -3, z = 4$

(b) $x = -3, y = 2, z = 4$

(c) $x = 4, y = -3, z = 2$

(d) $x = 2, y = 4, z = -3$

77. Solve the following system of linear equations:
$x + y + z = 15$, $2x - y + z = 12$ and $x - y - z = -1$

SSC CHSL 03/07/2024 (Shift-03)

(a) $x = 7, y = 5, z = 1$

(b) $x = 7, y = 2, z = 3$

(c) $x = 2, y = 5, z = 3$

(d) $x = 7, y = 5, z = 3$

78. The lines $x + y = 10$ and $-3x + y = 2$ have a unique solution. What is the distance (in units) between the unique solution and the point of intersection of the line $x + y = 10$ and the x-axis?

SSC CHSL 09/07/2024 (Shift-03)

(a) $8\sqrt{2}$ (b) 8

(c) 10 (d) $10\sqrt{2}$

79. The graphs of two linear equations, $x + 2y = 15$ and $4x + 8y = 13$ will be:

SSC CHSL 02/07/2024 (Shift-01)

(a) Parallel

(b) Coincident

(c) Intersecting at one point

(d) Intersecting at two points

80. If the lines $2y + 4x + 5 = 0$ and $y = 2 + ax$ are parallel, then find the value of a.
(a) 2
(b) −2
(c) −4
(d) 4

81. If the lines $y = 4x + 5$ and $y = (a + 1)x - 10$ are perpendicular, then find the value of a.
(a) $\frac{-1}{4}$ (b) $\frac{-5}{4}$
(c) $\frac{1}{4}$ (d) $\frac{5}{4}$

82. Find the distance between two parallel lines: $5x - 12y - 2 = 0$ & $5x - 12y + 3 = 0$.
(a) $\frac{3}{5}$ (b) $\frac{2}{13}$
(c) $\frac{5}{13}$ (d) $\frac{12}{13}$

83. If two lines $3x + 4y = 16$ and $6x + ky = 19$ having unique solution then find the value of k.
(a) $\frac{19}{3}$ (b) $\frac{19}{4}$
(c) $\frac{4}{19}$ (d) $\frac{3}{19}$

84. For what value of m will the system of equations $17x + my + 102 = 0$ and $23x + 299y + 138 = 0$ have infinite number of solutions?
SSC CGL TIER-II 02/03/2023
(a) 221
(b) 223
(c) 220
(d) 219

85. For what value of q does the system of equations $38x + qy + 171 = 0$ and $46x + 414y + 207 = 0$ have infinite number of solutions?
SSC Phase-XI 28/06/2023 (Shift-02)
(a) 380 (b) 345
(c) 342 (d) 350

86. For which of the following values of the system of equations $18x - 72y + 13 = 0$ and $7x - my - 17 = 0$ will have no solution?
SSC CGL TIER-II 06/03/2023
(a) 9 (b) 12
(c) 24 (d) 28

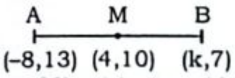
87. For what value of p does the system of equations $18x + 36y + 45 = 0$ and $px - 54y + 67 = 0$ have no solution?
SSC Phase-XI 30/06/2023 (Shift-02)
(a) 54 (b) − 27
(c) − 36 (d) 27

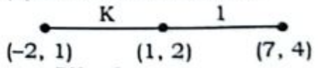
88. What is the solution to the following system of linear equations?
$3x - 9y + 4z = 5$
$2x + 7y + z = 12$
$3x - z = 0$
SSC Phase-XI 28/06/2023 (Shift-03)
(a) $x = \frac{143}{150}, y = \frac{31}{37}, z = \frac{143}{50}$
(b) $x = \frac{143}{150}, y = \frac{31}{30}, z = \frac{143}{50}$
(c) $x = \frac{137}{150}, y = \frac{31}{30}, z = \frac{143}{50}$
(d) $x = \frac{143}{150}, y = \frac{31}{30}, z = \frac{143}{51}$

ANSWER KEY

1.	(c)	2.	(d)	3.	(a)	4.	(d)	5.	(c)	6.	(b)	7.	(a)	8.	(b)	9.	(b)	10.	(d)
11.	(b)	12.	(a)	13.	(d)	14.	(a)	15.	(b)	16.	(a)	17.	(b)	18.	(a)	19.	(a)	20.	(a)
21.	(a)	22.	(d)	23.	(b)	24.	(a)	25.	(c)	26.	(b)	27.	(c)	28.	(d)	29.	(a)	30.	(b)
31.	(b)	32.	(c)	33.	(b)	34.	(a)	35.	(b)	36.	(c)	37.	(b)	38.	(c)	39.	(a)	40.	(b)
41.	(b)	42.	(b)	43.	(a)	44.	(a)	45.	(c)	46.	(d)	47.	(d)	48.	(c)	49.	(a)	50.	(c)
51.	(b)	52.	(c)	53.	(c)	54.	(d)	55.	(a)	56.	(c)	57.	(b)	58.	(a)	59.	(a)	60.	(b)
61.	(c)	62.	(a)	63.	(b)	64.	(c)	65.	(c)	66.	(c)	67.	(c)	68.	(b)	69.	(b)	70.	(a)
71.	(d)	72.	(d)	73.	(b)	74.	(b)	75.	(c)	76.	(a)	77.	(d)	78.	(a)	79.	(a)	80.	(b)
81.	(b)	82.	(c)	83.	(b)	84.	(a)	85.	(c)	86.	(d)	87.	(b)	88.	(b)				

SOLUTIONS

1. (c) Co-ordinates of the origin = (0, 0)
2. (d) Ordinate = y − ordinate = 6
3. (a) Abscissa = x − ordinate = 2
4. (d) Difference = $7 - (-3) = 10$
5. (c) $K = 2K - 1$
$K = 1$
6. (b) (−2, 4) (−, +) → 2nd quadrant
7. (a) $(1, \sqrt{3}) = 2\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
Polar coordinates = 2cos60°, 2sin60°
8. (b) Given,
$(x_1, y_1) = (3, -7) \Rightarrow (x_2, y_2) = (-5, 8)$
Distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$= \sqrt{(-5-3)^2 + (8-(-7)^2}$
$= \sqrt{64 + 225} = \sqrt{289}$
= 17 (8, 15, 17 are triplet)
9. (b) Given,
$(x_1, y_1) = (x, -1) \Rightarrow (x_2, y_2) = (3, 2)$
We know, d = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$\Rightarrow 25 = (3 - x)^2 + (2 + 1)^2$
$(3 - x)^2 = 25 - 9 = 16$
$3 - x = \pm 4$
$x = -1, 7$
Distance can not be negative so,
$x = 7$
10. (d)


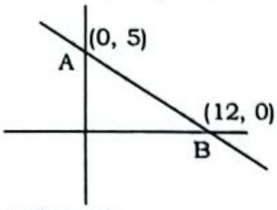
Given, M(x, y) is the mid point,
We know,
$x = \frac{x_2 + x_1}{2} \Rightarrow \frac{k - 8}{2} = 4$
K = 16
11. (b) Given,
$(x_1, y_1) = (2, -3), (x_2, y_2) = (-4, 6)$
and ratio, m : n = 1 : 2
We know,
$x = \frac{mx_2 + nx_1}{m + n}, y = \frac{my_2 + ny_1}{m + n}$
$x = \frac{2 \times 2 + 1 \times (-4)}{3} = 0$
$y = \frac{2 \times (-3) + 1 \times 6}{3} = 0$
$(x, y) = (0, 0)$
12. (a) Let the ratio is K : 1


$1 = \frac{7K - 2}{K + 1}$
$K + 1 = 7K - 2$
$6K = 3 \Rightarrow K = \frac{1}{2} \Rightarrow$ Ratio = 1 : 2
13. (d) Given,
$(x_1, y_1) = (2, 1) \Rightarrow (x_2, y_2) = (3, 5)$
And m : n = 2 : 3
Then,
$x = \frac{mx_2 - nx_1}{m - n}, \ y = \frac{my_2 - ny_1}{m - n}$
$x = \frac{6 - 6}{-1} = 0$
$y = \frac{10 - 3}{-1} = -7$
$(x, y) = (0, -7)$

14. (a) Given,
$(x_1, y_1) = (4, 2)$
$(x_2, y_2) = (7, 6)$
We know,

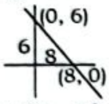
Slope, $M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-2}{7-4} = \frac{4}{3}$

15. (b)



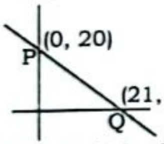
$5x + 12y = 60$
Put $x = 0 \Rightarrow y = 5$
$y = 0 \Rightarrow x = 12$
Length of AB =13(Triplet of 5, 12, 13)

16. (a)



$6x + 8y - 48 = 0$
Put $x = 0 \Rightarrow y = 6$
Put $y = 0 \Rightarrow x = 8$
Shortest length of intercept between x-axis and y-axis
$= \sqrt{6^2 + 8^2} = 10$ units

17. (b) $20x + 21y = 420$
Put $x = 0 \Rightarrow y = 20$
Put $y = 0 \Rightarrow x = 21$



Length of PQ = 29 (Triplet of 20, 21, 29)

18. (a) $12x - 9y - 108 = 0$
$12x - 9y = 108$
$\frac{12x}{108} - \frac{9y}{108} = 1$
$\frac{x}{9} - \frac{y}{12} = 1$
x-intercept = 9

19. (a) equation of line when slope and y - intercept given
$\Rightarrow y = mx + c,$
Here c is y - intercept
$\Rightarrow y = 5x + 12 \Rightarrow y - 5x - 12 = 0$

20. (a) Given,
$(x_1, y_1) = (2, -5)$
Slope, $m = -3$
Equation of line
$(y - y_1) = m(x - x_1)$
$\Rightarrow [y - (-5)] = -3(x - 2)$
$\Rightarrow y + 5 = -3x + 6 \Rightarrow 3x + y - 1 = 0$

21. (a) Given,
$(x_1, y_1) = (-3, 5)$
Slope, $m = \frac{2}{3}$
Equation of line is given by
$y - y_1 = m(x - x_1)$
$\Rightarrow (y - 5) = \frac{2}{3}(x + 3)$
$\Rightarrow 3y - 15 = 2x + 6$
$\Rightarrow 2x - 3y = -21$

22. (d) Passing points of line (–1, 5) and (2, 7)
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-5}{2+1} = \frac{2}{3}$
Equation of line is
$(y - y_1) = m(x - x_1)$
$\Rightarrow (y - 5) = \frac{2}{3}(x + 1)$
$\Rightarrow 3y - 15 = 2x + 2$
$\Rightarrow 2x - 3y + 17 = 0$

23. (b) Passing point = (2, 3)
Second passing point = mid point of (4, 9) and (6, 5)
Second point $= \left(\frac{4+6}{2}, \frac{9+5}{2}\right)$
$= \left(\frac{10}{2}, \frac{14}{2}\right) = (5, 7)$
$m = \frac{7-3}{5-2} = \frac{4}{3}$
Hence, equation is given by-
$y - 3 = \frac{4}{3}(x - 2) \Rightarrow 3y - 9 = 4x - 8$
$4x - 3y = -1$

24. (a) Intercept form of equation of a line
$\frac{x}{a} + \frac{y}{b} = 1$
$\Rightarrow \frac{x}{5} + \frac{y}{4} = 1$
$4x + 5y = 20 \Rightarrow 4x + 5y - 20 = 0$

25. (c) $3p - 2q + 23 = 0$ ......(i)
$-2p + q - 13 = 0$ ......(ii)
Multiple (ii) by 2 and add it from (i),
$p = -3 \Rightarrow q = 7$
$\therefore 3p + q = 3 \times -3 + 7 = -2$

26. (b) $x + y = 2$ ....(i)
$2x - y = 1$ ......(ii)
Adding equation (i) and (ii),
$3x = 3 \Rightarrow x = 1$
And $y = 1$
$y = Kx + 5 \Rightarrow 1 = K + 5$
$\Rightarrow K = -4$

27. (c) ATQ,
$x + y = 5$ .....(i)
$x - y = 3$ .....(ii)
On saving equation (i) & (ii)
$x = 4$, and $y = 1$
∴ The cordintes of the point common = (4, 1)

28. (d) (a, b) is intersect point then it satisfy both the equations.
$3x + y - 5 = 0$
$3a + b - 5 = 0$
$3a + b = 5$

Alternate Method:

To find point of intersection of given lines:
$$\begin{array}{r} 3x + y = 5 \\ + \; 2x - y = 5 \\ \hline 5x = 10 \end{array}$$
$x = 2 = a$
$\Rightarrow y = -1 = b$
$\therefore 3a + b = 6 - 1 = 5$

29. (a) $x - 7y = -42$ intersect y-axis on (a, b) and on y-axis, x-cordinate is '0'
Then,
$0 - 7y = -42$
$y = 6$ then $(a, b) = (0, 6)$
$6x + y - 15 = 0$ intersect x-axis at (g, d).
at x-axis $y = 0$
$6x = 15$
$x = \frac{5}{2} = 2.5$
Then $(g, d) = (2.5, 0)$
Then $(a + b + g + d)$
$= 0 + 6 + 2.5 + 0 = 8.5$

30. (b) $3x - 5y = 19$, $3x - 7y = -1$
Interception point of given line is (a, b)
Then it satisfy both the equation.
$3a - 5b = 19$
$-7a + 3b = -1$
by solving the equation
$(a, b) = (-2, -5)$
$\Rightarrow 3a - b = 3 \times (-2) - (-5)$
$= -6 + 5 = -1$

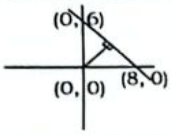
31. (b) $3x - 20y = 2$, $11x - 5y = -61$
by solving the equation
$(x, y) = (a, b) = (-6, -1)$
$\frac{(a^2 + b^2 - ab)}{(a^2 - b^2 + ab)} = \frac{36 + 1 - 6}{36 - 1 + 6} = \frac{31}{41}$

32. (c) $4x - 2y = 10$ .....(i)
$4x - 10y = 2$ ....(ii)
intersect point = (a, 4)
Put (a, 4) in eq. .....(i)
$4a - 2 \times 4 = 10$
$4a = 18$
$\left(a = \frac{9}{2}\right)$
Put $\left(\frac{9}{2}, 4\right)$ in eq. ....(ii)
$4 \times \frac{9}{2} + K \times 4 = 2$
$18 + 4K = 2$
$4K = -16$
$\Rightarrow K = -4$

33. (b) Given equation are of the form, $y = mx + c$
$y = 2x + 5$, $y = -3x - 2$
comparing, we get
$m_1 = 2$, $m_2 = -3$
We know,
$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right| = \left|\frac{2+3}{1 - 2 \times 3}\right|$
$= \left|\frac{5}{-5}\right| = 1$
$\tan\theta = 1$
$\theta = 45°$

34. (a) $3x + 4y - 12 = 0$
Point = (–5, 8)
$d = \frac{3 \times (-5) + 4 \times 8 - 12}{\sqrt{9 + 16}}$
$= \frac{-15 + 32 - 12}{5}$
$d = 1$ unit

35. (b)



It point origin (00) than perpendicular distance of a line

$= \frac{|C|}{\sqrt{a^2+b^2}} = \frac{|-48|}{\sqrt{6^2+8^2}} = 4.8$ unit

Alternate Method:

Perpendicular distance of a line ax + by + c = 0 from a point (x, y)

$= \frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}} = \frac{|0+0-48|}{\sqrt{6^2+8^2}} = \frac{48}{10} = 4.8$

36. (c) $3x + 4y + 7 = 0$

Point = (0, 0)

$d = \frac{7}{\sqrt{9+16}} = \frac{7}{5}$

37. (b) A(6, 7) B(1, 2) C(–5, 8)

$AB = \sqrt{(6-1)^2+(7-2)^2} = 5\sqrt{2}$

$BC = \sqrt{(1+5)^2+(2-8)^2} = 6\sqrt{2}$

$AC = \sqrt{(6+5)^2+(7-8)^2} = \sqrt{122}$

Since,

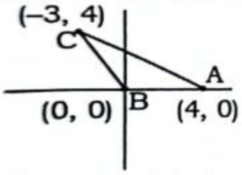
$\sqrt{122})^2 = (6\sqrt{2})^2 + (5\sqrt{2})^2$

$= 72 + 50$

$122 = 122$

Which satisfies Pythagorean theorem of a right angled triangle.

38. (c) (4, 0), (0, 0), (–3, 4)



Obtuse angled triangle.

Alternate Method:

A = (4, 0), B = (0, 0), C = (–3, 4)

$AB = \sqrt{4^2+0^2} = 4 \rightarrow a$

$BC = \sqrt{(-3)^2+4^2} = 5 \rightarrow b$

$AC = \sqrt{(-3-4)^2+(4-0)^2} = \sqrt{49+16}$

$= \sqrt{65} \rightarrow c$

$a^2 = 16 \Rightarrow b^2 = 25$

$\Rightarrow c^2 = 65$

Now, sides property of triangle

$\boxed{a^2 + b^2 < c^2}$

So Δ is obtuse triangle

39. (a) If three points are collinear then slope with any two points will be equal.

(1, 2) (3, 4) (5, – a)

$m = \frac{y_2-y_1}{x_2-x_1} = \frac{4-2}{3-1} = \frac{-a-4}{5-3}$

$\frac{4-2}{3-1} = \frac{-a-4}{5-3}$

$\frac{2}{2} = \frac{-a-4}{2}$

$\Rightarrow a = -6$

40. (b) $x + y = 3$, $2x + 5y = 12$ and x-axis

Intersection points of triangle's sides

(I) $x + y = 3 \Rightarrow 2x + 5y = 12$

point = (1, 2)

(II) $x + y = 3$ and x-axis

at x-axis $(y = 0)$

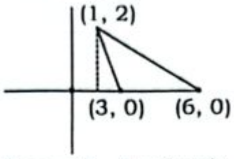
Then $x = 3$

point = (3, 0)

(III) $2x + 5y = 12$ and x-axis

$2x + 0 = 12 \Rightarrow x = 6$

Point = (6, 0)

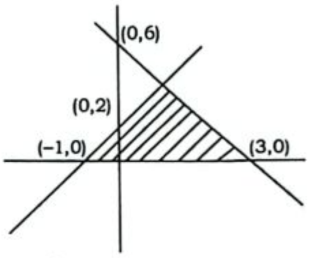


Base = 6 – 3 = 3 unit

Height = 2 unit

Area $= \frac{1}{2} \times 3 \times 2 = 3$ unit²

41. (b)



$$\begin{array}{r} 2x+y=6 \\ \underline{2x-y=-2} \\ 2y=8 \\ y=4 \end{array}$$

Area of bounded region $= \frac{1}{2} \times 4 \times 4$

= 8 square units

42. (b) A(2, 4), B(0, 0) C(–3, 6)

Area of $\Delta = \frac{1}{2} | x_1(y_2 - y_3) + x_2 (y_3 - y_1) + x_3(y_1 - y_2) |$

$= \frac{1}{2} | 2(0-6) + 0(6-4) - 3(4-0) |$

$= \frac{1}{2} | -12 - 12 | = 12$ unit²

43. (a) The intersection points of given lines

x-axis ⇒ y = 0

y-axis ⇒ $x = 0$

and

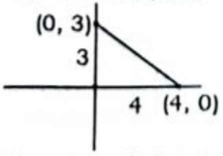
$3x + 4y - 12 = 0$

$\Rightarrow 3(0) + 4y = 12$

$\Rightarrow y = 3$ ie, (0, 3)

and $3x + 4(0) = 12$

$\Rightarrow x = 4$ ie, (4, 0)



Given, triangle is a right angle triangle

Area of R.A.T $= \frac{1}{2} \times 4 \times 3$

= 6 unit²

44. (a) $8x + 3y = 24$, $2x - y = -8$, x-axis

by solving $8x + 3y = 24$ and $2x - y = -8$

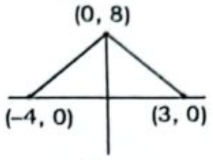
$x = 0$, $y = 8$

by solving $8x + 3y = 24$ and x-axis

$x = 3$, $y = 0$

by solving $2x + y = -8$ and x-axis

$x = -4$, $y = 0$



Area $= \frac{1}{2} \times 7 \times 8 = 28$ sq. unit

45. (c) Co-ordinate of centroid

$= \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

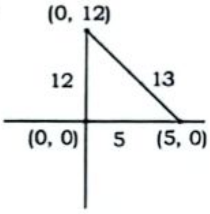
(2, – 2), (6, –3), (4, 2)

$x = \frac{2+6+4}{3} = \frac{12}{3} = 4$

$y = \frac{-2-3+2}{3} = -1$

C = (4, –1)

46. (d)



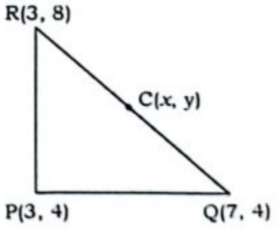
$r = \frac{12+5-13}{2} = 2$

Incenter of R.A.T. = (r, r) = (2, 2)

47. (d) Orthocenter of right angle triangle is lies at right angle.

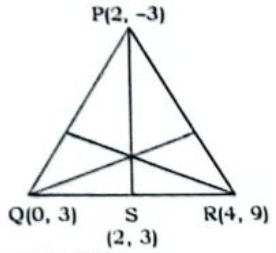
Orthocenter = (3, 4)

48. (c) Circumcenter of right angel triangle is at mid point of hypotenuse.



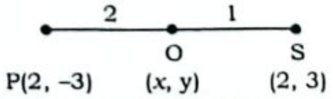
$C(x, y) = \left(\frac{7+3}{2}, \frac{8+4}{2}\right) = (5, 6)$

49. (a)



S is M.P of QR

S = (2, 3)

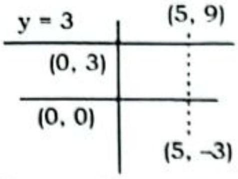


$x = \frac{2\times2+1\times2}{2+1} = \frac{6}{3} = 2$

$y = \frac{1\times-3+2\times3}{3} = \frac{3}{3} = 1$

O = (2, 1)

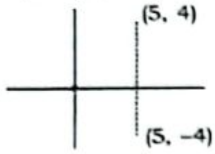
50. (c)



Reflection of point (x, y) across line y = a is (x, 2a – y)

(5, –3) → (5, 6 – (–3)) = (5, 9)

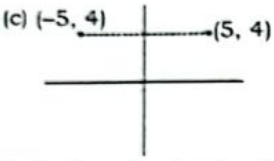
51. (b)



Reflection of point (x, y) on x-axis is (x,– y)

∴ Reflection of (5,4) is (5,– 4)

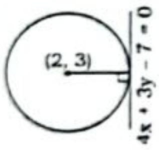
52. (c)



Reflection of point (x, y) on y-axis is (–x, y)

∴ Reflection of (5, 4) is (–5, 4)

53. (c)



Radius of circle = $\frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$

$= \frac{4\times2+3\times3-7}{\sqrt{4^2+3^2}} = \frac{10}{5} = 2$ unit

54. (d) C(1, 2), r = 4 cm

equation of circle = $(x-h)^2 + (y-k)^2 = r^2$

$(x-1)^2 + (y-2)^2 = 16$

$x^2 + y^2 - 2x - 4y + 5 = 16$

$x^2 + y^2 - 2x - 4y = 11$

55. (a) $x^2 + y^2 + 6x + 8y + 11 = 0$

General equation of circle

$\Rightarrow x^2 + y^2 + 2gx + 2fy + C = 0$

Where

Center = (–g, –f) , $r = \sqrt{g^2+f^2-c}$

Center = $\left(\frac{-6}{2}, \frac{-8}{2}\right) = (-3, -4)$

Radius = $\sqrt{9+16-11} = \sqrt{14}$

56. (c) Equation of Sphere

$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$

$\Rightarrow (x+1)^2 + (y-2)^2 + (z+3)^2 = 3^2$

$\Rightarrow x^2 + 1 + 2x + y^2 + 4 - 4y + z^2 + 9 + 6z = 9$

$x^2 + y^2 + z^2 + 2x - 4y + 6z + 5 = 0$

57. (b) Unique solution condition,

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{4}{6} \neq \frac{6}{K+4}$

$\Rightarrow 4K + 16 \neq 36 \Rightarrow 4K \neq 20 \Rightarrow K \neq 5$

58. (a) $K_1x + 3y = 8$ ......(i)

$4x + K_2y = 16$ ......(ii)

Note:- For coincident lines

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

On comparing equation

$\frac{K_1}{4} = \frac{3}{K_2} = \frac{8}{16}$

So,

$\frac{3}{K_2} = \frac{8}{16}$, then $\frac{K_1}{4} = \frac{8}{16}$

$\Rightarrow K_2 = 6, \quad K_1 = 2.$

So, we can say $K_2 = 3K_1$

59. (a) Given,

$5x + 7y - 8 = 0$

If linear pair of equation have no solution-

Then,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$a_1 = 5,\ b_1 = 7,\ c_1 = -8$

Go through by option-

(a). $5x + 7y - 16 = 0$

$a_2 = 5,\ b_2 = 7,\ c_2 = -16$

$\frac{5}{5} = \frac{7}{7} \neq \frac{-8}{-16}$

Hence, option (a) is right answer.

60. (b) $4x + (k-2)y + 3 = 0$......(i)

$(k-2)x + 9y - 5 = 0$ ....(ii)

For parallel line:-

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Now,

$\frac{4}{k-2} = \frac{k-2}{9}$

$\Rightarrow (k-2)^2 = 36 \Rightarrow k - 2 = \pm6$

$\Rightarrow k = -4, +8$

$\therefore k^2 + 6 = 8^2 + 6 = 70$

61. (c) Given,

$x + y + z = 12$

$x + y - z = 6$

$x - y + z = 4$

From options, put the value of option (c) in equations will satisfy

(c) $x = 5$, $y = 4$, $z = 3$ satisfies.

Alternate Method:

Given,

$x + y + z = 12$ ....(i)

$x + y - z = 6$ ....(ii)

$x - y + z = 4$ ....(iii)

ATQ,

Add equation (i) & (ii)

$2(x + y) = 18$

$x + y = 9$ ....(iv)

Putting equation (iv) in equation (i)

Get, z = 3

Putting value of z in equation (iii)

Get, $x - y = 1$ ....(v)

From equation (iv) & (v)

$x = 5$ & $y = 4$ and $z = 3$

62. (a) $2x + 7ky - 8 = 0$

$x + y - 9 = 0$

For no. solution,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{2}{1} = \frac{7k}{1} \neq \frac{8}{9}$

$\therefore k = \frac{2}{7}$

63. (b) $x + 2z = 3$ .....(i)

$x + 2y + 3z = 5$ .....(ii)

$3x - 5z = -13$ ....(iii)

By hit and trial -

Put, $x = -1$ & $z = 2$

Equation (i), (ii) & (iii) satisfied.

$\therefore x = -1, y = 0, z = 2$

Alternate Method:

$x + 2z = 3$ .....(i)

$x + 2y + 3z = 5$ .....(ii)

$3x - 5z = -13$ ....(iii)

ATQ,

From equation (i) & (iii)

$$\left.\begin{array}{ll} x + 2z = 3 & ....(i) \\ 3x - 5z = -13 & ....(iii) \end{array}\right\} \begin{array}{l} \times3 \\ \times1 \end{array}$$

$$\begin{array}{r} 3x + 6z = 9 \\ \underline{\overset{-}{}3x \overset{+}{-} 5z = \overset{+}{-}13} \\ 11z = 22 \\ \therefore z = 2 \end{array}$$

Putting value of z in equation (i)

$x + 4 = 3$

$\therefore x = -1$

Putting value of x & z in equation (ii)

$-1 + 2y + 6 = 5$

$2y = 0$

$\therefore y = 0$

∴ Required answer

$x = -1$, $y = 0$ & $z = 2$

64. (c) $0.4x + 0.16y = 1.7$ ....(i)

$0.3x + 0.12y = 3.4$ ....(ii)

$\frac{a_1}{a_2} = \frac{4}{3}, \frac{b_1}{b_2} = \frac{4}{3}, \frac{c_1}{c_2} = \frac{1}{2}$

$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

So, There is no solution.

65. (c) For Infinitely many solution:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Now,

$ax + by = 2$ .....(i)

$3x - (5 - 2a)y = 6$ ....(ii)

then,

$\frac{a}{3} = \frac{b}{-5+2a} = \frac{2}{6}$

$\Rightarrow -5a + 2a^2 = 3b \Rightarrow (-5 + 2a)a = 3b$

By option,

$\Rightarrow$ Put, a = 1, b = –1

66. (c) $2x + y = a$

$8x + by = 12$

For infinite solution,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{2}{8} = \frac{1}{b} = \frac{a}{12}$

$\Rightarrow b = 4, a = 3$

$\therefore a + b = 3 + 4 = 7$

67. (c) $5x - 3y + 7z = 22$ .....(i)
$3x - 5y - 2z = -46$ .....(ii)
$2x - 2y + 5z = 24$ .....(iii)
Add. eqn. (ii) and (iii),
$5x - 7y + 3z = -22$ .....(iv)
Subtracting eqn. (iv) from (i)
$4y + 4z = 44 \Rightarrow y + z = 11$
By option, $y = 3$, $z = 8$ (only option (c) satisfies the condition)
$\therefore x = -5, y = 3, z = 8$

68. (b) By option,
$x = 1, y = 1, z = 1$
(i) $5x + 4y - 8z = 1$
$5(1) + 4(1) - 8(1) = 1$
$5 + 4 - 8 = 1$
$1 = 1$ (satisfied)
(ii) $7x - 9y + z = -1$
$7(1) - 9(1) + 1 = -1$
$7 - 9 + 1 = -1$
$-1 = -1$ (satisfied)
(iii) $2x + 3y - 4z = 1$
$2(1) + 3(1) - 4(1) = 1$
$2 + 3 - 4 = 1$
$5 - 4 = 1$
$1 = 1$ (satisfied)

Alternate Method:
$5x + 4y - 8z = 1$ .....(i)
$7x - 9y + z = -1$ ....(ii)
$2x + 3y - 4z = 1$ ...(iii)
Eq. (i) + eq. (iii)
$7x + 7y - 12z = 2$ ....(iv)
Eq. (iv) – eq. (ii)
$\Rightarrow (7x + 7y - 12z = 2) - (7x - 9y + z = -1)$
$\Rightarrow 16y - 13z = 3$
$\therefore$ Putting value $y = z = 1$
Put, value of y and z in equation (iv)
$\Rightarrow 7x + 7 - 12 = 2 \Rightarrow 7x = 7 \Rightarrow x = 1$
$\therefore x = y = z = 1$

69. (b) Given,
$x - ay = 2 - a$
$(1 - a)x + 6y = a + b$
for no. solution:-
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$
$$\frac{1}{1-a} = \frac{-a}{6} \neq \frac{2-a}{a+b}$$
$6 = a^2 - a$
$= a(a - 1) = 3(3 - 1)$
$a = 3$
Put $a = 3$
$$\Rightarrow \frac{-3}{6} \neq \frac{2-3}{3+b} \Rightarrow 3 + b \neq 2$$
$\therefore b \neq -1$

70. (a) $kx - 15y + 7 = 0$
$7x - 21y - 19 = 0$
For no solution candition,
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$
$$\Rightarrow \underbrace{\frac{k}{7} = \frac{-15}{-21}} \neq \frac{7}{-19}$$
$\Rightarrow k = 5$

71. (d) Given,
$4x + 12y + 36 = 0$
and, $5x + ky + 45 = 0$
have infinite solution,
$$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \underbrace{\frac{4}{5} = \frac{12}{k}} = \frac{36}{45}$$
$\Rightarrow k = 15$

72. (d) $ax + (a^2 + 1)y = 4$
$4x + ay = a^2$
Put $a = 6$
$6x + 37y = 4$ ....(i)×2
$4x + 6y = 36$ ....(ii)×3
Solving above equations:
$$y = \frac{-100}{56} = \frac{-25}{14}$$
option (a) and (b) eliminated
Now, put $a = -12$
$-12x + 145y = 4$ ....(iii)
$4x - 12y = 144$ ....(iv)
Solving, $x = 48$, $y = 4$
Hence, option (d) is correct

73. (b) $3x + 2y = 7$
$2x + 3y = 7$
The given equation have unique solution,
$$\text{since, } \frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$$
$$\frac{3}{2} \neq \frac{2}{3} = \frac{7}{7}$$
Hence, the given equation have unique solution,

74. (b) $x + 2ky - 8 = 0$
$2x - y - 16 = 0$
Value of k for infinite solutions.
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$
$$\text{So, } \frac{1}{2} = \frac{2k}{-1} = \frac{8}{16} \Rightarrow \frac{2k}{-1} = \frac{8}{16}$$
$$\therefore k = -\frac{1}{4}$$
For infinite solutions $k = -\frac{1}{4}$

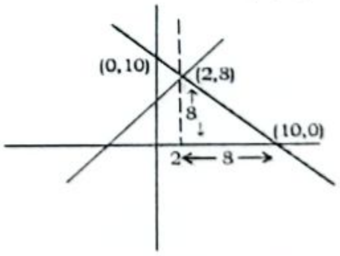
75. (c) $3x + y = 3$ ...(i)
$(a - b)x + (a + b)y = 3a + b - 3$ ...(ii)
For infinite solutions
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$
$$\Rightarrow \frac{3}{a-b} = \frac{1}{a+b} = \frac{3}{3a+b-3}$$
$$\because \frac{1}{a+b} = \frac{3}{3a+b-3}$$
$\Rightarrow 3a + b - 3 = 3a + 3b$
$$\Rightarrow 2b = -3 \Rightarrow b = \frac{-3}{2}$$
$$\because \frac{3}{a-b} = \frac{1}{a+b}$$
$\Rightarrow 3a + 3b = a - b \Rightarrow 2a = -4b$
$$\Rightarrow 2a = -4 \times \left(\frac{-3}{2}\right) \Rightarrow a = 3$$
$$\therefore a = 3, b = \frac{-3}{2}$$

76. (a) Given,
$x + 1.5y + 2z = 5.5$ ....(i)
$x + 5y + 7x = 15$ ....(ii)
$3x + 11y + 13z = 25$ ....(iii)
Go through option,
$x = 2, y = -3, z = 4$ Satisfied the above equation,
Hence, option (a) is right answer.

77. (d) By option (d)
$$\begin{matrix} x & + & y & + & z & = 15 \\ \downarrow & & \downarrow & & \downarrow & \\ \Rightarrow 7 & & 5 & & 3 & = 15 \end{matrix}$$
Option's (d) value satisfy the above given equation.

Alternate Method:
$x + y + z = 15$ ....(i)
$2x - y + z = 12$ ....(ii)
$x - y - z = -1$ ....(iii)
ATQ,
Adding equation (i) & (iii)
$2x = 14$
$\therefore x = 7$
Putting value of x in equation (i)
$x + y + z = 15$
$y + z = 15 - 7 = 8$
Putting value of x in equation (ii)
$14 - 12 = y - z$
$y - z = 2$
$\therefore x = 7, y + z = 8, y - z = 2$
Only option (d) is fulfill this criteria
$\therefore x = 7, y = 5, z = 3$

78. (a)
$$\begin{array}{r} x + y = 10 \\ -3x + y = 2 \\ \hline 4x = 8 \end{array}$$
$x = 2$
$x + y = 10 \Rightarrow y = 8$
Point of intersection = (2, 8)



Distance = $\sqrt{8^2 + 8^2} = 8\sqrt{2}$ unit

79. (a) $x + 2y = 15$
$4x + 8y = 13$
$$\Rightarrow \frac{1}{4} = \frac{2}{8} \neq \frac{15}{13}$$
$$\Rightarrow \frac{1}{4} = \frac{1}{4} \neq \frac{15}{13}$$
$$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$
So, given linear equations will be parallel.

80. (b) $4x + 2y = -5$
$ax - y = -2$
for parallel lines
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \Rightarrow \frac{4}{a} = \frac{2}{-1} \Rightarrow a = -2$$

81. (b) $4x - y = -5$

$(a - 1)x - y = 10$

for perpendicular lines

$a_1a_2 + b_1b_2 = 0$

$4(a + 1) + 1 = 0$

$$a + 1 = \frac{-1}{4} \Rightarrow a = \frac{-5}{4}$$

82. (c) $5x - 12y - 2 = 0$

$5x - 12y + 3 = 0$

$$d = \frac{|c_2 - c_1|}{\sqrt{a^2 + b^2}} = \frac{5}{\sqrt{25 + 144}} \Rightarrow d = \frac{5}{13}$$

83. (b) Given, equ.

$3x + 4y = 16$

$6x + ky = 19$

For unique solutions,

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\Rightarrow \frac{4}{k} = \frac{16}{19} \Rightarrow k = \frac{19}{4}$$

84. (a) Given, equ.

$17x + my + 102 = 0$

$23x + 299y + 138 = 0$

For infinite solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$$\left(\frac{17}{23} = \frac{m}{299} = \frac{102}{138}\right) = \left(\frac{17}{23} = \frac{m}{299} = \frac{17}{23}\right)$$

$$m = \frac{299 \times 17}{23} = 221$$

85. (c) Given, equ.

$38x + qy + 171 = 0$

$46x + 414y + 207 = 0$

For infinite solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$$\left(\frac{38}{46} = \frac{q}{414} = \frac{171}{207}\right) = \left(\frac{19}{23} = \frac{q}{414} = \frac{19}{23}\right)$$

$$q = \frac{414 \times 19}{23} = 342$$

86. (d) Given, equations are:

$18x - 72y + 13 = 0$

$7x - my - 17 = 0$

For no solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

$$\Rightarrow \frac{18}{7} = \frac{-72}{-m} \Rightarrow m = 28$$

87. (b) Given, equ.

$18x + 36y + 45 = 0$

$px - 54y + 67 = 0$

For no solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

$$\Rightarrow \frac{18}{p} = \frac{36}{-54} \Rightarrow p = -27$$

88. (b) Given,

$3x - 9y + 4z = 5$ .... (i)

$2x + 7y + z = 12$ .... (ii)

$3x - z = 0$ .... (iii)

By equ. (iii) $z = 3x$

Put $z = 3x$ in equ. (i) and (ii)

$15x - 9y = 5 \Rightarrow 5x + 7y = 12$

By solve the equations,

$$y = \frac{31}{30}, x = \frac{143}{150}$$

$z = 3x$ (given)

$$z = \frac{3 \times 143}{150} = \frac{143}{50}$$

SMART APPROACH:-

$z = 3x$ is only satisfied in option a and b and $y = \frac{31}{30}$ is in option (b) So, option (b) is correct

SPEED BOOSTER HACKS

◆ Pythagorean Triplets ◆

A set of three integers *a, b, c* which satisfy Pythagoras Theorem ($a^2 + b^2 = c^2$) or are the sides of aright-angled triangle is called Pythagorean triplets.

Note: When we multiply or divide or any triplet, the result is also a triplet.

Standard triplet

$(a^2 - b^2)$, $2ab$, $(a^2 + b^2)$

(3,4,5)	(20, 21, 29)	(20, 99, 101)	(36, 77, 85)	(39, 80, 89)	(5, 12, 13)	(65, 72, 97)	(7, 24, 25)
(15, 112, 113)	(21, 72, 75)	(8, 15, 17)	(9, 40, 41)	(11, 60, 61)	(8,15,17)	(12, 35,37)	(48,55,73)
(36,77,85)	(33,56,65)	(16,63,65)	(13, 84, 85)	(15, 112, 113)	(17, 144, 145)	(19, 180, 181)	(28,45,53)

SPEED BOOSTER HACKS

◆ Square roots from 1 to 12 ◆

$\sqrt{1} = 1$	$\sqrt{5} = 2.236$	$\sqrt{9} = 3$
$\sqrt{2} = 1.414$	$\sqrt{6} = 2.449$	$\sqrt{10} = 3.162$
$\sqrt{3} = 1.732$	$\sqrt{7} = 2.646$	$\sqrt{11} = 3.316$
$\sqrt{4} = 2$	$\sqrt{8} = 2.828$	$\sqrt{12} = 3.464$

26 Chapter

MENSURATION 2D & 3D

MENSURATION-2D

◆ TYPE – I ◆
(A) EQUILATERAL TRIANGLE

1. If the perimeter of an equilateral triangle is 36 units, then its area is (in square units):

SSC CGL 11/09/2024 (Shift-01)

(a) $114\sqrt{2}$ (b) $36\sqrt{2}$
(c) $114\sqrt{3}$ (d) $36\sqrt{3}$

2. What is the area (in cm^2) of an equilateral triangle whose perimeter is 24 cm ?

Note: Round of to the nearest two decimal places.

SSC CHSL 05/07/2024 (Shift-03)

(a) 28.14 (b) 27.71
(c) 13.86 (d) 27.14

3. The perimeter of a triangle is 36 units. Its area cannot be more than ------ square units.

SSC CHSL 02/07/2024 (Shift-03)

(a) $36\sqrt{2}$ (b) $36\sqrt{3}$
(c) $12\sqrt{7}$ (d) $18\sqrt{5}$

4. The perimeter of equilateral triangle is $3 \times \left(\sqrt[4]{\frac{16}{3}}\right)$ units. Determine the area of the triangle.

SSC Phase-XI 30/06/2023 (Shift-04)

(a) 4 $unit^2$ (b) 1 $unit^2$
(c) 3 $unit^2$ (d) 2 $unit^2$

5. The length of each side of an equilateral triangle is 22 cm. Find the area (in cm^2) of this triangle.

SSC CHSL 02/08/2023 (Shift-04)

(a) 121 (b) $242\sqrt{3}$
(c) $121\sqrt{3}$ (d) 242

6. Find the area of an equilateral triangle whose sides are 12 cm.

SSC CHSL 17/08/2023 (Shift-03)

(a) $38\sqrt{3}$ cm^2 (b) $35\sqrt{3}$ cm^2
(c) $34\sqrt{3}$ cm^2 (d) $36\sqrt{3}$ cm^2

7. The altitude of an equilateral triangle is $3\sqrt{3}$ cm. Find its area.

SSC CHSL 05/07/2024 (Shift-04)

(a) $9\sqrt{3}$ sq cm (b) 9 sq cm
(c) $3\sqrt{3}$ sq cm (d) 27 sq cm

8. The length of the median of an equilateral triangle is $6\sqrt{3}$ cm. What is the area of this triangle?

SSC MTS 05/09/2023 (Shift-03)

(a) 36 cm^2 (b) $72\sqrt{3}$ cm^2
(c) $36\sqrt{3}$ cm^2 (d) 72 cm^2

9. Median of an equilateral triangle is $15\sqrt{3}$ cm. What is the length of side of this triangle?

SSC CHSL 13/03/2023 (Shift-01)

(a) 24 cm (b) 18 cm
(c) 30 cm (d) 36 cm

10. If each side of an equilateral triangle is $37\sqrt{3}$ cm, then its altitude (in cm) is equal to

SSC CGL 23/09/2024 (Shift-03)

(a) 37.5 (b) 18.5
(c) 60.5 (d) 55.5

11. The height of an equilateral triangle is $7\sqrt{3}$ cm. What is the area of this equilateral triangle?

SSC CGL 06/12/2022 (Shift-02)

(a) $36\sqrt{3}$ cm^2
(b) $25\sqrt{3}$ cm^2
(c) $49\sqrt{3}$ cm^2
(d) $32\sqrt{3}$ cm^2

12. The area of an equilateral triangle is $289\sqrt{3}$ cm^2. Find the length (in cm) of its sides.

SSC Phase XII 25/06/2024 (Shift-02)

(a) 34 (b) 17
(c) 36 (d) 27

13. The area of an equilateral triangle is $4\sqrt{3}$ cm^2. Find the side (in cm) of the triangle.

SSC CPO 03/10/2023 (Shift-03)

(a) $2\sqrt{3}$ cm (b) 2 cm
(c) $\sqrt{3}$ cm (d) 4 cm

14. The length of each side of a triangle is 12 cm. What is the length of the circumradius of the triangle?

SSC CGL 24/07/2023 (Shift-01)

(a) $8\sqrt{3}$ cm (b) $2\sqrt{3}$ cm
(c) $6\sqrt{3}$ cm (d) $4\sqrt{3}$ cm

15. ABC is an equilateral triangle. P, Q and R are the mid-points of sides AB, BC and CA, respectively. If the length of the side of the tΔABC is 11 cm, then the area (in cm^2) of ΔPQR is:

SSC CGL 13/09/2024 (Shift-02)

(a) $\frac{21\sqrt{3}}{16}$ (b) $\frac{11\sqrt{3}}{16}$
(c) $\frac{121\sqrt{3}}{16}$ (d) $\frac{111\sqrt{3}}{16}$

16. The area of a field in the shape of a Regular hexagon is $1944\sqrt{3}m^2$. What will be the cost (in ₹) of fencing it at the rate of ₹11.50 per meter?

SSC CPO 24/11/2020 (Shift-01)

(a) 2,256 (b) 3,200
(c) 2,785 (d) 2,484

◆ TYPE – I ◆
(B) SCALENE TRIANGLE

17. Find the area of triangle whose sides are 10 cm, 12 cm, and 18 cm.

SSC CPO 11/11/2022 (Shift-02)

(a) $22\sqrt{2}$ cm^2 (b) $30\sqrt{2}$ cm^2
(c) $28\sqrt{2}$ cm^2 (d) $40\sqrt{2}$ cm^2

18. The area of the triangle whose sides are 3 cm, 5 cm, and 6 cm is:

SSC Phase-XI 30/06/2023 (Shift-02)

(a) $\sqrt{14}$ cm^2 (b) $2\sqrt{14}$ cm^2
(c) $4\sqrt{14}$ cm^2 (d) $3\sqrt{14}$ cm^2

19. What is the area of triangular flower bed of a garden whose perimeter is 20 meters and two sides are 5 meters and 6 meters.

SSC CHSL 08/08/2023 (Shift-04)

(a) 7 (b) 5
(c) 6 (d) $10\sqrt{2}$

20. Find the area of a triangle whose two sides are 4 cm and 5 cm and the angle between them is 45°.

SSC CPO 04/10/2023 (Shift-02)

(a) $7\sqrt{2}cm^2$ (b) $4\sqrt{2}cm^2$
(c) $6\sqrt{2}cm^2$ (d) $5\sqrt{2}cm^2$

21. The difference between the semi-perimeter and the sides of ΔPQR are 18 cm, 17 cm and 25 cm, respectively. Find the area of the triangle.

SSC CPO 11/11/2022 (Shift-03)

(a) $330\sqrt{510}cm^2$ (b) $230\sqrt{510}cm^2$
(c) $30\sqrt{510}cm^2$ (d) $130\sqrt{510}cm^2$

◆ TYPE – I ◆
(C) ISOSCELES TRIANGLE

22. The perimeter of an isosceles triangle is 100 cm. If the base is 36 cm, then find its semi perimeter (in centimeters).

SSC CGL 21/07/2023 (Shift-02)

(a) 64 (b) 60
(c) 45 (d) 50

23. The perimeter of an isosceles triangle is 91 cm. If one of the equal sides measures 28 cm, then what is the value of the other non-equal side?

SSC CHSL 17/03/2023 (Shift-03)

(a) 56 cm (b) 42 cm
(c) 14 cm (d) 35 cm

24. In an isosceles triangle, if the unequal side is 8 cm and equal side is 5 cm. then the area of the triangle is:

SSC CHSL 03/08/2023 (Shift-01)

(a) 12 cm^2 (b) 25 cm^2
(c) 6 cm^2 (d) 11 cm^2

25. Three sides of a triangle are $\sqrt{a^2+b^2}, \sqrt{(2a)^2+b^2}$ and $\sqrt{a^2+(2b)^2}$ units. What is the area (in unit squares) of triangle?

SSC CGL TIER-II 03/02/2022

(a) $\frac{5}{2}$ ab (b) 3ab

(c) 4ab (d) $\frac{3}{2}$ ab

26. The ratio of the length of each equal side and the third side of an isosceles triangle is 3:5. If the area of the triangle is $30\sqrt{11}$ cm² then the length of the third side (in cm) is:

SSC CGL TIER-I 18/07/2023 (Shift-02)

(a) $10\sqrt{6}$ (b) $5\sqrt{6}$

(c) $13\sqrt{6}$ (d) $11\sqrt{6}$

27. If the perimeter of an isosceles right triangle is $8(\sqrt{2}+1)$ cm, then the length of the hypotenuse of the triangle is:

SSC CGL TIER-II 18/11/2020

(a) 10 cm (b) 8 cm

(c) 24 cm (d) 12 cm

28. In a triangle ABC, AB = BC and the perimeter of ΔABC is $8(2+\sqrt{2})$cm. If the length of BC is $\sqrt{2}$ times the length of AB, then find the area of ΔABC.

SSC CGL TIER-II 18/11/2020

(a) 28 cm² (b) 36 cm²

(c) 32 cm² (d) 16 cm²

29. A right-angled isosceles triangle has an area of 50 square units. Its hypotenuse is (in units):

SSC CGL 09/09/2024 (Shift-02)

(a) $10\sqrt{3}$ (b) $5\sqrt{5}$

(c) $10\sqrt{2}$ (d) $5\sqrt{2}$

30. In an isosceles right triangle, the perimeter is 30 m. Find its area (in m²). (Rounded off to the nearest integral value)

SSC CHSL 11/08/2023 (Shift-02)

(a) 41 (b) 36

(c) 39 (d) 34

31. The perimeter of an isosceles right-angled triangle having an area of 200 cm² is:

SSC Phase-XI 28/06/2023 (Shift-01)

(a) 68.3 cm (b) 78.2 cm

(c) 70.6 cm (d) 58.6 cm

32. The area of an isosceles right angled triangle is 16 m². Its hypotenuse is _____.

SSC CHSL 08/07/2024 (Shift-03)

(a) 0.8 m (b) 2 m

(c) 8 cm (d) 8 m

• TYPE – I •

(D) RIGHT ANGLED TRIANGLE

33. Find the area of a triangle whose base is 7 cm and corresponding height is 82 cm.

SSC MTS 08/09/2023 (Shift-03)

(a) 574 cm² (b) 287 cm²

(c) 143 cm² (d) 191 cm²

34. If the area of a triangle whose base measures 6 cm is 18 cm², then its height is:

SSC CHSL 03/07/2024 (Shift-04)

(a) 3.1 cm (b) 2.2 cm

(c) 9 cm (d) 6 cm

35. If three sides of a triangle are 6 cm, 8 cm and 10 cm, then the area of the triangle is:

SSC CHSL 09/07/2024 (Shift-04)

(a) $12\sqrt{3}$ cm² (b) 30 cm²

(c) 24 cm² (d) $24\sqrt{3}$ cm²

36. What is the area of a triangle whose sides are 12 cm, 13 cm and 5 cm?

SSC CPO 03/10/2023 (Shift-01)

(a) 15 cm² (b) 30 cm²

(c) 40 cm² (d) 70 cm²

37. The sides of a triangle are of length 8 cm, 15 cm and 17 cm. Find the area of the triangle.

SSC CHSL 14/08/2023 (Shift-04)

(a) 65 cm² (b) 75 cm²

(c) 60 cm² (d) 70 cm²

38. The sides of a triangle are in the ratio 5 : 12 : 13 and its perimeter is 90 cm. Find its area (in cm²).

SSC CPO 03/10/2023 (Shift-01)

(a) 270 cm² (b) 150 cm²

(c) 30 cm² (d) 60 cm²

39. The lengths of three sides of a triangle are in the ratio 3 : 4 : 5. Among three sides, the difference between the largest side and the smallest side of this triangle is 3.6cm. The area (in cm²) of the triangle is:

SSC CHSL 16/04/2021 (Shift-03)

(a) 21.75 (b) 19.44

(c) 32.4 (d) 15.64

40. A right angle triangle of area 600 m² is to be made such that the hypotenuse is double the base. For the triangle, the hypotenuse is _____ more than the base.

SSC CHSL 11/07/2024 (Shift-04)

(a) 20.36m (b) 22.32m

(c) 24.36m (d) 26.32m

41. The hypotenuse of a right triangle is 6m more than twice the shortest side. If the third side is 2 m less than the hypotenuse, find the area (in m²) of the triangle

SSC CHSL 09/07/2024 (Shift-01)

(a) 130 (b) 100

(c) 120 (d) 110

42. Find the height of the triangle whose base is two-thirds of its height and whose area is 363 cm².

SSC CHSL 05/07/2024 (Shift-02)

(a) 33 cm (b) 27 cm

(c) 29 cm (d) 31 cm

43. A triangle has its sides 5 cm, 12 cm and 13 cm. What will be the area of the triangle formed by joining the mid point of the three sides?

SSC MTS 14/09/2023 (Shift-02)

(a) 15 cm² (b) $13\frac{1}{2}$ cm²

(c) $7\frac{1}{2}$cm² (d) $19\frac{1}{2}$ cm²

44. In ΔABC, $\overline{BD} \perp \overline{AC}$, intersecting $\overline{AC}$ at D. Also, BD = 12 cm. If $m(\overline{AD})$ = 6 cm and $m(\overline{CD})$ = 4 cm, find the area (in cm²) of ΔABC.

SSC CHSL 11/08/2023 (Shift-02)

(a) 45 (b) 50

(c) 60 (d) 75

45. In a right-angled triangle, if the hypotenuse is 101 cm and one of its sides is equal to 20 cm, what is its area (in cm²)?

SSC PHASE-IX 2022

(a) 2020 (b) 1010

(c) 1980 (d) 990

46. The sides of a triangle are 24 cm, 26 cm and 10 cm, At each of its vertices, circles of radius 4.2 cm are drawn. What is the area (in cm²) of the triangle, excluding the portion covered by the sectors of the circles? [Take π = 22/7]

SSC CPO 23/11/2020 (Shift-01)

(a) 27.72 (b) 120

(c) 105.86 (d) 92.28

47. ΔABC is a right-angled triangle with ∠ABC = 90°. If $m(\overline{AB})$ = 28 cm, and $m(\overline{BC})$ = 96 cm, find the area (in cm²) of the circumcircle of ΔABC. (Use π = 3.14).

SSC CGL 26/09/2024 (Shift-01)

(a) 7,850 (b) 8,164

(c) 7,693 (d) 7,536

48. What is the difference in area (in cm²) of ΔABC having sides of 10 cm, 20 cm and 20 cm, and a right angled ΔPQR with hypotenuse of 13 cm and one of the perpendiculars of 12 cm?

Note: $\sqrt{2}$ = 1.41, $\sqrt{3}$ = 1.73, $\sqrt{7}$ = 2.65, $\sqrt{13}$ = 3.61, $\sqrt{15}$ = 3.87, $\sqrt{21}$ = 4.58

SSC CGL 17/09/2024 (Shift-01)

(a) 70.05 (b) 36.57

(c) 66.75 (d) 53.58

49. The in-radius of triangle is 8 cm, and the sum of the lengths of its sides is 125 cm. The area of the triangle (in cm²) is:

SSC CPO 29/06/2024 (Shift-02)

(a) 480 (b) 1000

(c) 250 (d) 500

• TYPE – II •

CIRCLE

50. Find the circumference of a circle whose area is 154 m².

SSC CHSL 01/07/2024 (Shift-03)

(a) 52 m (b) 44 m

(c) 29.5 m (d) 39 m

51. The circumference of the two circles is 198 cm and 352 cm respectively. What is the difference between their radii?

SSC CGL 01/12/2022 (Shift-01)

(a) 45 cm (b) 16.5 cm

(c) 49.5 cm (d) 24.5 cm

52. The area of a circle is 1386 cm^2. What is the radius of the circle? [Take $\pi = 22/7$]

SSC CPO 10/11/2022 (Shift-02)

(a) 7 cm (b) 14 cm
(c) 18 cm (d) 21 cm

53. The radii of two circles are 8 cm and 15 cm. The perimeter of the circle having area equal to the sum of the areas of the two circles (in cm) is:

SSC CGL 24/09/2024 (Shift-02)

(a) 32π (b) 30π
(c) 28π (d) 34π

54. Find the diameter (in cm) of a circle whose circumference is equal to the sum of the circumferences of two circles of radii 12 cm and 16 cm.

SSC CGL 25/09/2024 (Shift-02)

(a) 32 (b) 56
(c) 64 (d) 28

55. The ratio of circumference and diameter of a circle is 3 : 5. If the circumference is 6 cm, then the radius of the circle is:

SSC CGL 25/09/2024 (Shift-03)

(a) 10 cm (b) 15 cm
(c) 5 cm (d) 1.8 cm

56. Two parallel lines touch the circles at P and Q. Area of the circle is 154cm^2. Find the length of PQ. [Take $\pi = 22/7$]

SSC CHSL 03/08/2023 (Shift-02)

(a) 58.2 cm (b) 14 cm
(c) 7 cm (d) 77 cm

57. The circumference of the two circles is 264 m and 308 m respectively. What is the difference between the area of the larger circle and the smaller circle?

SSC CHSL 17/03/2023 (Shift-02)

(a) 2002 m^2 (b) 2010 m^2
(c) 1890 m^2 (d) 1990 m^2

58. A race track is in the shape of a ring whose inner and outer circumferences are 880 m and 1012 m, respectively. What is the area (in m^2) of the track? [Take $\pi = 22/7$]

SSC PHASE-IX 2022

(a) 25284 (b) 26488
(c) 19866 (d) 13244

59. The ratio of areas of two circles is 81:121. What will be the ratio of their circumferences?

SSC CHSL 20/03/2023 (Shift-03)

(a) 9 : 11 (b) 121 : 81
(c) 11 : 9 (d) 81 : 121

60. The cost of building a fence around a circular field is ₹7425 at the rate of ₹13.50 per feet. What is the area of the circular field? [Take $\pi = 22/7$]

SSC MTS 12/07/2022 (Shift-02)

(a) 25018.5 ft^2 (b) 23864.4 ft^2
(c) 24644.5 ft^2 (d) 24062.5 ft^2

61. The difference between the areas of two concentric circles is 88 cm^2. If the radius of the inner circle is 6 cm, then the area (in cm^2) of the larger circle is closest to: [Take $\pi = 22/7$]

SSC MTS 08/10/2021 (Shift-02)

(a) 197 cm^2 (b) 198 cm^2
(c) 196 cm^2 (d) 201 cm^2

62. The area of circular park is 12474 m^2. There is 3.5 m wide path around the park. What is the area (in m^2) of the path? [Take $\pi = 22/7$]

SSC CGL 13/08/2021 (Shift-03)

(a) 1424.5 (b) 1435.5
(c) 1380.5 (d) 1440.5

63. The area of a circular path enclosed by two concentric circles is 3080 m^2. If the difference between the radius of the outer edge and that of inner edge of the circular path is 10 m, what is the sum (in m) of the two radii?

SSC CGL 23/08/2021 (Shift-02)

(a) 70 (b) 112
(c) 98 (d) 84

64. A 64 cm wide path is made around a circular garden having a diameter of 10 meters. The area (in m^2) of the path is closest to: [Take $\pi = 22/7$]

SSC CPO 24/11/2020 (Shift-02)

(a) 21 (b) 11
(c) 15 (d) 9

65. A race track is in the shape of a ring whose inner and outer circumference is 440m and 506 m, respectively. What is the cost of levelling the track at ₹6/m^2 ? [Take $\pi = 22/7$]

SSC CGL 03/03/2020 (Shift-02)

(a) ₹18966 (b) ₹24832
(c) ₹19866 (d) ₹29799

66. The area of a circular path enclosed by two concentric circles is 3080 m^2. If the difference between the radius of the outer edge and that of inner edge of the circular path is 10 m, what is the sum (in m) of the two radii? [Use $\pi = 22/7$]

SSC CGL 23/08/2021 (Shift-02)

(a) 70 (b) 112
(c) 98 (d) 84

67. The sum of the radii of two circles is 286cm and the area between the concentric circles is 50336 cm^2. What are the radii (in cm) of the two circles? [Take $\pi = 22/7$]

SSC CHSL 15/04/2021 (Shift-02)

(a) 91 and 84 (b) 171 and 84
(c) 115 and 91 (d) 115 and 171

68. The inner and outer radii of a circular track are 25 m and 28 m, respectively. The cost (in) of levelling the track at Rs.28 per m^2 is: [Use $\pi = \frac{22}{7}$]

SSC CGL 11/09/2024 (Shift-01)

(a) 15,421 (b) 13,992
(c) 11,229 (d) 17,355

69. Two equal circles are drawn on a square in such a way that opposite side of the square forms the diameter of each circle. If the remaining area of the square is 42 cm^2, what is the measurement (in cm) of the diameter of each circle?

SSC CHSL 02/07/2024 (Shift-03)

(a) 3.5 (b) 2.5
(c) 14 (d) 7

70. From a circular sheet of cirumference 264 cm, two equal maximum-sized circular plates are cut off. What will be the circumference of each plate?

$\left(\text{Use } \pi = \frac{22}{7}\right)$

SSC CHSL 08/07/2024 (Shift-03)

(a) 264 cm (b) 135 cm
(c) 176 cm (d) 132 cm

71. A chord of the larger among two concentric circles is of length 20 cm and it is tangent to the smaller circle. What is the area (in cm^2) of the circular portion between the two circles?

SSC CGL 13/09/2024 (Shift-02)

(a) 100π (b) 164π
(c) 122π (d) 175π

72. Two circles of radius 7 units each, intersect in such a way that the common chord is of length 7 units. What is the common area in square units of the intersection?

SSC CHSL 01/07/2024 (Shift-04)

(a) $98\left(\frac{\pi}{6}-\frac{\sqrt{3}}{3}\right)$ (b) $98\left(\frac{\pi}{3}-\frac{\sqrt{3}}{4}\right)$
(c) $98\left(\frac{\pi}{6}-\frac{\sqrt{3}}{6}\right)$ (d) $98\left(\frac{\pi}{6}-\frac{\sqrt{3}}{4}\right)$

73. The area of the largest triangle that can be inscribed in a semi-circle of radius 6 cm is:

SSC CHSL 11/08/2021 (Shift-03)

(a) 35 cm^2 (b) 34 cm^2
(c) 38 cm^2 (d) 36 cm^2

74. Three circles of radius 7 cm are kept touching each other. The string is tightly tied around these three circles. What is the length of the string?

SSC CGL 08/12/2022 (Shift-01)

(a) $42 + 7\pi$ cm (b) $21\pi + 14$ cm
(c) $42 + 14\pi$ cm (d) $7 + 14\pi$ cm

75. Three circles each of radius 5 cm touch one another. The area (in cm^2) subtended between them is:

SSC CPO 28/06/2024 (Shift-03)

(a) $50\left(\sqrt{3}-\frac{\pi}{2}\right)$ (b) $25\left(\sqrt{3}+\frac{\pi}{2}\right)$
(c) $25\left(2\sqrt{3}-\frac{\pi}{2}\right)$ (d) $25\left(\sqrt{3}-\frac{\pi}{2}\right)$

76. Find the area (in cm^2) of a circle with a maximum radius that can be inscribed in a rectangle of length 18 cm and breadth 12 cm.

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 72π (b) 136π
(c) 36π (d) 28π

77. The area (in cm^2) of biggest circle that could be drawn in a square of side 18 cm is:

SSC CHSL 10/03/2023 (Shift-02)

(a) 91π (b) 81π
(c) 49π (d) 168π

78. One-quarter of a circular pizza of radius 21 cm was removed from the whole pizza. What is the perimeter (in cm) of the remaining pizza? (Use $\pi = \frac{22}{7}$)

SSC CGL 13/09/2024 (Shift-01)

(a) 99 (b) 141
(c) 128 (d) 131

79. A copper wire is bent in the form of a square and it encloses an area of 30.25 cm². If the same wire is bent to form a circle, then find the area of the circle.
SSC CHSL 11/08/2023 (Shift-02)
(a) 38.50 cm² (b) 42.25 cm²
(c) 35 cm² (d) 30.25 cm²

80. When a wire is bent in the form of a square, then the area enclosed by it is 5929 cm². If wire is bent into the form of a circle, then what will be the area enclosed by the wire?
SSC MTS 02/05/2023 (Shift-02)
(a) 7546 cm² (b) 8542 cm²
(c) 7632 cm² (d) 6954 cm²

81. Three circles of radius 6 cm are kept touching each other. The string is tightly tied around these three circles. What is the length of the string?
SSC CGL 03/12/2022 (Shift-02)
(a) 36 + 12π cm (b) 36 + 18π cm
(c) 24 + 36π cm (d) 36 + 20π cm

82. A smaller circle touches a bigger circle internally and also passes through the center 'O' of the bigger circle. If the area of the smaller circle is 192 cm², the area of the bigger circle (in cm²) is:
SSC MTS 05/07/2022 (Shift-03)
(a) 768 m² (b) 384 m²
(c) 1024 m² (d) 720 m²

83. The area of a triangular park, whose sides are 160 m, 300 m and 340 m, is $4\frac{17}{22}$ times of the area of a circular park. What is the perimeter (in m) of the circular park (correct to one decimal place)? [Take π = 22/7]
SSC PHASE-IX 2022
(a) 240.2 (b) 253.2
(c) 251.4 (d) 248.8

84. The side of an equilateral triangle is 28 cm. Taking each vertex as the centre, a circle is described with a radius equal to half the length of the side of the triangle. Find the area of that part of the triangle which is not included in the circles (use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$).
SSC CGL 10/09/2024 (Shift-01)
(a) 30.89 cm² (b) 38.08 cm²
(c) 31.08 cm² (d) 39.08 cm²

85. What is the radius (in m) of a circular field whose area is equal to six times the area of a triangular field whose sides are 35 m, 53 m and 66 m ? [Take π = 22/7]
SSC PHASE-IX 2022
(a) 21 (b) 42
(c) 14√3 (d) 14√16

86. The ratio of the outer and the inner circumference of a circular path is 17:15. If path is 40 meters wide, then what is the radius of the inner circle?
SSC MTS 02/05/2023 (Shift-03)
(a) 280 m (b) 340 m
(c) 360 m (d) 300 m

87. The ratio of the outer and the inner circumference of a circular path is 5:4. If path is 50 metres wide, then what is the radius of the inner circle?
SSC CGL 06/12/2022 (Shift-03)
(a) 250 meters (b) 300 meters
(c) 200 meters (d) 210 meters

88. The ratio of the outer and the inner circumference of a circular path is 7 : 6. If the path is 45 m wide, then what is the radius (in m) of the inner circle?
SSC CHSL 10/07/2024 (Shift-02)
(a) 240 (b) 120
(c) 150 (d) 270

89. The diameter of a wheel is 1.33 m. What distance (in m, to the nearest whole number) will it travel in 380 revolutions? [Take π = 22/7]
SSC CHSL 16/04/2021 (Shift-01)
(a) 1856 (b) 1855
(c) 1685 (d) 1588

90. A wheel makes 500 revolutions in covering a distance of 44 km. Find the radius of the wheel
SSC CHSL 10/03/2023 (Shift-02)
(a) 14 m (b) 21m
(c) 28 m (d) 7 m

91. If a wheel has diameter 42 cm, then how far does the wheel go (in meters) in 12 revolutions?
[Take π = 22/7]
SSC CPO 23/11/2020 (Shift-02)
(a) 15.84 (b) 23.27
(c) 21.45 (d) 17.64

92. If a map of a city was drawn on a scale of 0.2 cm to a km, what area would represent a country if it has an area of 22500km²?
SSC CHSL 04/08/2023 (Shift-02)
(a) 2500cm² (b) 2250cm²
(c) 5625cm² (d) 900cm²

93. The perimeter of a semi-circle is 56.54 cm. What is its diameter (in cm)? (Useπ = 3.14)
SSC CHSL 04/07/2024 (Shift-03)
(a) 11 (b) 22
(c) 10 (d) 20

94. Akshay places three identical rings of diameter 21 cm in such a manner that each one touches the other two rings. He observes that there is a space enclosed by the circles. What is the area (in cm²) of this portion? (Take π = 22/7)
Note: Rounded off to nearest 2 decimal places and √3 = 1.732
SSC CGL TIER-II (20/01/2025)
(a) 18.25 (b) 24.12
(c) 17.70 (d) 20.65

• TYPE – III •
SECTOR OF A CIRCLE

95. Which of the following statements is INCORRECT about the circle?
SSC CHSL 08/07/2024 (Shift-04)
(a) The area of a sector = $\frac{1}{2}$ (arc length × R)
(b) The length of an arc = $\frac{\text{central angle made by the arc}}{360°}$
(c) The radius of an incircle of an equilateral triangle of side 's' is $\frac{s}{2\sqrt{3}}$
(d) Circles are congruent if they have same radii while similar circles may have different radii.

96. The central angle of a sector is 80° and length is 96π. What is the radius of the circle?
SSC CGL 26/09/2024 (Shift-02)
(a) 196 units (b) 204 units
(c) 116 units (d) 216 units

97. From a circle, a sector with a central angle of 30° is cut off. If the length of the arc of this sector is 5.5 cm, then find the radius (in cm) of the circle.
[Use $\pi = \frac{22}{7}$]
SSC CHSL 04/07/2024 (Shift-04)
(a) 12 (b) 10
(c) 10.5 (d) 11

98. The following formula is used to calculate which of the following?
$\frac{\text{angle of arc at centre}}{360°} \times \pi \times \text{diameter}$
SSC CGL 25/07/2023 (Shift-01)
(a) Length of a sector
(b) Area of an arc
(c) Length of an arc
(d) Radius of a circle

99. An arc of length 23.1 cm subtends an 18° angle at the center. What is the area of the circle? [Take π = 22/7]
SSC CGL 17/07/2023 (Shift-02)
(a) 16978.50 cm² (b) 16988.50 cm²
(c) 16878.50 cm² (d) 16798.50 cm²

100. Find the length of the arc of the sector of a circle of diameter 7 cm with a central angle of 108°. [Use π = 22/7]
SSC CGL TIER-I 19/07/2023 (Shift-01)
(a) 6.6 cm (b) 5.6 cm
(c) 13.2 cm (d) 11.2 cm

101. In a circle of radius 42 cm, an arc subtends an angle of 60° at the center. Find the length of the arc.
[Take π = 22/7]
SSC CPO 05/10/2023 (Shift-01)
(a) 22 cm (b) 44 cm
(c) 21 cm (d) 42 cm

102. A coconut tree swings with the wind in such a manner that the angle covered by its trunk is 18°. If the topmost portion of the tree covers a distance of 44 meters, find the length of the tree.
SSC CGL 12/12/2022 (Shift-02)
(a) 120 meters (b) 210 meters
(c) 140 meters (d) 70 meters

103. If the arc of a circle of radius 30 cm has a length of 19 cm, then the angle (in degrees, rounded off to two decimal places) subtended at the center of the circle is: [Take $\pi = 22/7$]

SSC CPO 11/11/2022 (Shift-01)

(a) 51.25°
(b) 16.27°
(c) 36.27°
(d) 46.25°

104. The area of a sector of a circle is 88 sq. cm., and the angle of the sector is 45°. Find the radius of the circle [Take $\pi = 22/7$]

SSC CGL 09/12/2022 (Shift-04)

(a) $3\sqrt{11}$ cm
(b) $4\sqrt{14}$ cm
(c) $6\sqrt{13}$ cm
(d) $5\sqrt{14}$ cm

105. The area of a sector of a circle is 88 cm² and the angle of the sector is 36°. Find the radius (in cm) of the circle. [Use $\pi = 22/7$]

SSC Phase-XII 20/06/2024 (Shift-03)

(a) $3\sqrt{70}$
(b) $\sqrt{70}$
(c) $2\sqrt{70}$
(d) $5\sqrt{70}$

106. The area of a sector of a circle that subtends a 22.5° angle at the center is given as 346.5 cm². What will be the radius (in cm) of the circle?
[Use $\pi = 22/7$]

SSC CHSL 11/08/2023 (Shift-03)

(a) 35
(b) 45
(c) 42
(d) 48

107. The area of the sector of a circle of radius 12 cm is 32π cm². Find the length of the corresponding arc of the sector.

SSC CGL 17/07/2023 (Shift-04)

(a) $\frac{16}{3}\pi$ cm
(b) $\frac{13}{3}\pi$ cm
(c) $\frac{10}{3}\pi$ cm
(d) $\frac{8}{3}\pi$ cm

108. Find the area of the sector of a circle with radius 4 cm and angle 30°.

SSC CGL 06/12/2022 (Shift-01)

(a) 7.186 cm²
(b) 6.186 cm²
(c) 4.186 cm²
(d) 5.186 cm²

109. From a circle with the radius of 15.75 cm, a sector with the arc length of 11 cm is cut off. Find the area (in cm²) of this sector.

SSC CGL 09/09/2024 (Shift-02)

(a) 86.525
(b) 86.625
(c) 86.875
(d) 86.125

110. Find the area of a sector with an arc length of 44 cm, which subtends a central angle of 30°.

SSC CGL 12/09/2024 (Shift-02)

(a) 1488 cm²
(b) 1584 cm²
(c) 1848 cm²
(d) 1884 cm²

111. For a given circle of radius 4 cm, the angle of its sector is 45°. Find the area (in cm) of the sector.
(Use $\pi = 3.14$.)

SSC CHSL 03/07/2024 (Shift-03)

(a) 7.28
(b) 6.18
(c) 6.28
(d) 7.18

112. Find the area (in cm²) of the sector of a circle of radius 21 cm with a central angle of 60°. [Use $\pi = 22/7$]

SSC CPO 28/06/2024 (Shift-01)

(a) 231
(b) 289
(c) 302
(d) 245

113. What is the area of the sector of a circle whose radius is 35 cm and whose arc subtends an angle of 72° at the center of the circle? [Use $\pi = 22/7$]

SSC CPO 29/06/2024 (Shift-02)

(a) 810 cm²
(b) 610 cm²
(c) 770 cm²
(d) 970 cm²

114. A sector of a circle of radius 10 cm is formed at 60° angle at the center. What will be its area (Take $\pi = 3.14$)?

SSC CGL 17/07/2023 (Shift-04)

(a) 52.33 cm²
(b) 75.28 cm²
(c) 60.67 cm²
(d) 55.00 cm²

115. Find the area (in cm²) of the sector whose perimeter is $\frac{64}{3}$ cm and central angle is 60°. (Use $\pi = \frac{22}{7}$)

SSC CGL 09/09/2024 (Shift-03)

(a) $\frac{47}{3}$
(b) $\frac{77}{3}$
(c) $\frac{68}{3}$
(d) $\frac{85}{3}$

116. Find the measure of the central angle of a sector if its area is 16π and the radius is 8.

SSC CGL 17/09/2024 (Shift-01)

(a) 75°
(b) 60°
(c) 108°
(d) 90°

117. If the area of a sector of a circle is 462 cm² and the central angle is 120°, then its radius is ____.

SSC CGL 19/09/2024 (Shift-03)

(a) 18cm
(b) 17cm
(c) 21cm
(d) 14cm

118. The area of sector of a circle having radius 14 cm is 231 cm². Find the degree measure of the corresponding central angle. [Use $\pi = 22/7$]

SSC CPO 28/06/2024 (Shift-02)

(a) 125°
(b) 150°
(c) 140°
(d) 135°

119. What is the perimeter (in cm, rounded off to one decimal place) of the sector of a circle with a radius of 10 cm and of angle 30°?
(Use $\pi = 3.14$)

SSC CGL 09/09/2024 (Shift-03)

(a) 20.4
(b) 35.7
(c) 82.8
(d) 25.2

120. A circular arc whose radius is 12 cm makes an angle of 30° at the centre. Find the perimeter (in cm) of the sector formed. (Use $\pi = 3.14$)

SSC CGL 12/09/2024 (Shift-03)

(a) 32.38
(b) 30.28
(c) 28.64
(d) 26.24

121. A circular arc makes an angle of 15° at the centre, If the radius of the circular arc is 14 cm, what is the perimeter (correct up to two decimal places) of the sector so formed? ($\pi = 3.14$)?

SSC CGL 17/09/2024 (Shift-03)

(a) 17.66 cm
(b) 21.32 cm
(c) 35.32 cm
(d) 31.66 cm

122. A circular arc whose radius is 24 cm makes and angle of 60° at the centre. The perimeter of the sector formed is: (Use $\pi = 3.14$)

SSC CGL 18/09/2024 (Shift-01)

(a) 73.22 cm
(b) 63.12 cm
(c) 74.32 cm
(d) 73.12 cm

123. A circular arc whose radius is 14 cm, makes an angle of 45° at the centre. Find the perimeter (in cm) of the sector. (Use $\pi = \frac{22}{7}$)

SSC CGL 25/09/2024 (Shift-02)

(a) 38
(b) 28
(c) 39
(d) 34

124. The perimeter of a minor sector of a circle of radius 4 units subtending an angle of 45° is:

SSC CHSL 02/07/2024 (Shift-01)

(a) $4 - \pi$ units
(b) $8 - \pi$ units
(c) $8 + \pi$ units
(d) $4 + \pi$ units

125. If the angle of the sector with radius 7 cm is 120° then find the length of the sector (in cm). (Use $\pi = \frac{22}{7}$)

SSC CHSL 05/07/2024 (Shift-03)

(a) $\frac{44}{3}$
(b) $\frac{22}{3}$
(c) $\frac{67}{3}$
(d) $\frac{47}{3}$

126. A circular arc whose radius is 4 cm makes an angle 45° at the center. Find the perimeter of the sector formed.

SSC CGL 27/07/2023 (Shift-03)

(a) $\frac{78}{7}$cm
(b) $\frac{72}{7}$cm
(c) $\frac{74}{7}$cm
(d) $\frac{76}{7}$cm

127. Find the perimeter of major sector of a circle of radius 12 meters, whose minor sector subtends an angle of 75° at the center.

SSC CPO 09/11/2022 (Shift-01)

(a) $24 + 5\pi$ meters
(b) $24 + 19\pi$ meters
(c) $24 - 5\pi$ meters
(d) $24 - 19\pi$ meters

128. The area of a sector of a circle of radius 12 cm, formed by an arc of length 7 cm is:

SSC CGL 13/09/2024 (Shift-03)

(a) 42 cm²
(b) 84 cm²
(c) 21 cm²
(d) 28 cm²

129. Find the area (in cm²) of the sector, where the radius of the circle is 24 cm and length of the arc is 7 cm.

SSC CGL 18/09/2024 (Shift-03)

(a) 72
(b) 84
(c) 48
(d) 168

130. What is the area (in square units) of the sector if the radius of the circle is given to be 24 units and the arc length is 7.5 units?

SSC CHSL 11/07/2024 (Shift-04)

(a) 135
(b) 180
(c) 45
(d) 90

131. If the radius of a circle is 48 cm and the length of the arc is 15 cm, then the area of the sector corresponding to that arc is:

SSC CHSL 10/07/2024 (Shift-01)

(a) 380 m^2 (b) 360 m^2
(c) 720 m^2 (d) 7200 m^2

132. Find the area of a minor sector of a circle whose circumference is 88 cm and the length of its minor arc is 22 cm [Use $\pi = 22/7$].

SSC CPO 27/06/2024 (Shift-02)

(a) 154 cm^2 (b) 451 cm^2
(c) 415 cm^2 (d) 145 cm^2

133. The perimeter of a sector of a circle of radius 7.4 cm is 20.6 cm. The area of this sector is:

SSC CHSL 10/08/2023 (Shift-03)

(a) 42.92 cm^2 (b) 5.8 cm^2
(c) 10.73 cm^2 (d) 21.46 cm^2

134. The perimeter of a minor of a circle of radius 5 cm is 15.5 cm. Find the area of the minor sector [Use $\pi = 22/7$]

SSC CHSL 11/08/2023 (Shift-01)

(a) 17.53 cm^2 (b) 13.75 cm^2
(c) 13.57 cm^2 (d) 17.35 cm^2

135. What is the central angle of a sector of a circle whose area and perimeter are, respectively, equal to 209 cm^2 and 63 cm if it is given that its radius is a non-negative integer (roundup to one decimal place)?

SSC CGL 10/09/2024 (Shift-03)

(a) 55.5° (b) 53.5°
(c) 49.5° (d) 51.5°

136. The minute hand of a clock is 20 cm long. Find the area on the surface of the clock swept by the minute hand between 8 a.m. and 8:45 a.m.

SSC CGL 12/12/2022 (Shift-01)

(a) $\frac{6600}{7}cm^2$ (b) $\frac{6600}{9}cm^2$
(c) $\frac{6600}{18}cm^2$ (d) $\frac{6600}{14}cm^2$

• TYPE – IV •
QUADRILATERAL

137. Let ABCD be a quadrilateral and AC, BD be diagonals. The length of BD = 20 cm and the heights of the ΔABD and ΔBCD are 6 cm and 8 cm respectively. Find the area of the quadrilateral ABCD (in cm^2).

SSC CHSL 03/07/2024 (Shift-03)

(a) 140 (b) 120
(c) 148 (d) 1282

138. There is a circle with a centre T and a radius of 8 cm. Two tangents KE and KI are drawn from point K, which is 17 cm from the centre. The area of the quadrilateral TEKI is:

SSC CHSL 04/07/2024 (Shift-01)

(a) 130 cm^2 (b) 136 cm^2
(c) 120 cm^2 (d) 127.5 cm^2

139. What will be the area of a plot of quadrilateral shape, one of whose diagonals is 20 m and lengths of the perpendiculars from the opposite vertices on it are 12 m and 18 m, respectively?

SSC CPO 05/10/2023 (Shift-02)

(a) 250 m^2 (b) 400 m^2
(c) 200 m^2 (d) 300 m^2

140. In ΔPQR, M, N, and S are the mid-points of sides PQ, PR and QR, respectively. If the area of the ΔPQR is 46 cm^2, what is the area (in cm^2) of the quadrilateral MNRQ?

SSC CGL 11/09/2024 (Shift-02)

(a) 39 (b) 27.6
(c) 23 (d) 34.5

141. From a point A, which is at a distance of 17 cm from the centre C of a circle with radius 8 cm, the pair of tangents AB and AD to the circle are drawn. The area of the quadrilateral ABCD is _____ cm^2.

SSC CGL 26/09/2024 (Shift-01)

(a) 192 (b) 120
(c) 60 (d) 360

• TYPE – V •
RECTANGLE

142. Find the area of a rectangle whose length is 52m and breadth is 9m.

SSC CGL 23/09/2024 (Shift-03)

(a) 468 m^2 (b) 253 m^2
(c) 625 m^2 (d) 552 m^2

143. The perimeter of a rectangle is 70 cm and its diagonal is 25cm. The area of the rectangle is:

SSC CHSL 08/07/2024 (Shift-01)

(a) 425 cm^2 (b) 300 cm^2
(c) 625 cm^2 (d) 420 cm^2

144. The area of a rectangular field is 3600 m^2. If the field is 45 m long, what is its perimeter?

SSC CHSL 03/07/2024 (Shift-02)

(a) 255 m (b) 250 m
(c) 265 m (d) 260 m

145. The area of a rectangular field is 480 m^2. If the length is 20% more than the breadth, then the length of the rectangular field is:

SSC CPO 04/10/2023 (Shift-02)

(a) 24 m (b) 20 m
(c) 27 m (d) 30 m

146. The ratio of the length to width of a certain rectangle is 3 : 2 and the area is 150 cm^2. The perimeter of the rectangle (in cm) is:

SSC CGL 24/07/2023 (Shift-01)

(a) 20 (b) 30
(c) 50 (d) 40

147. The ratio between the length and the breadth of a rectangular park is 3 : 2, and the perimeter of the park is 120 m. Find the area (in m^2) of the park.

SSC CGL TIER-II (20/01/2025)

(a) 144 (b) 968
(c) 864 (d) 454

148. In a rectangular field, the sum of the length and the breadth is 9 cm and area is 18 cm^2. If the length is 'a' and breadth is 'b', then find the value of $(a^2 - ab + b^2)$.

SSC CGL 19/09/2024 (Shift-03)

(a) 36 (b) 24
(c) 18 (d) 27

149. The perimeter of a rectangular garden is 48 m. If the length is 6 m more than the breadth, the area (in m^2) of the garden is?

SSC CGL 18/09/2024 (Shift-01)

(a) 135 (b) 96
(c) 84 (d) 112

150. The length of a rectangular shaped park exceeds its breadth by 15 m. If the perimeter of the park is 110 m, find the length of the park (in m).

SSC CHSL 09/07/2024 (Shift-01)

(a) 20 (b) 35
(c) 25 (d) 40

151. If the semi-perimeter and area of a rectangular field whose length and breadth are 'x' and 'y' is 12 cm and 28 cm^2, respectively, then find the value of $x^4 + x^2y^2 + y^4$.

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 6990 (b) 6609
(c) 6906 (d) 6960

152. Half the perimeter of a rectangular garden, whose length is 8 cm more than its width, is 42 cm. Find the area of the rectangular garden.

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 542 cm^2 (b) 425 cm^2
(c) 254 cm^2 (d) 524 cm^2

153. The dimensions of a rectangular field when extended by 6 meters are in the ratio of 4 : 3 and when decreased by 6 meters are in the ratio of 2 : 1. Find the dimensions of the field

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 14 meters, 10 meters
(b) 18 meters, 12 meters
(c) 16 meters, 12 meters
(d) 10 meters, 6 meters

154. The width of a rectangle is 2 m less than its length. If the perimeter of the rectangle is 68 m, then what is the length (in m) of the rectangle?

SSC CGL 20/07/2023 (Shift-04)

(a) 20 (b) 18
(c) 16 (d) 17

155. A field is 150 m long and 80 m wide. How many times (rounded off to 1 decimal place) is its perimeter to the length of its diagonal?

SSC CGL 25/07/2023 (Shift-01)

(a) 2.3 (b) 2.5
(c) 2.7 (d) 3.1

156. Half of the perimeter of a rectangle is 30 cm. If the length of the rectangle is 6 cm more than its breadth, then what is the area of the rectangle?

SSC CHSL 14/03/2023 (Shift-04)

(a) 216 cm^2 (b) 250 cm^2
(c) 185 cm^2 (d) 195 cm^2

157. The breadth of a rectangular floor is $\frac{3}{5}$ of its length. If the area of the floor is 60 meter² then what is the difference between the length and breadth of the floor?

SSC CHSL 15/03/2023 (Shift-02)

(a) 6 m (b) 7.5 m
(c) 5 m (d) 4 m

158. If the length of certain rectangle is decreased by 4 cm and breadth is increased by 2 cm, it would result in a square of the same area. What is the perimeter of the original rectangle?

SSC CGL 06/12/2022 (Shift-01)

(a) 15 cm (b) 24 cm
(c) 20 cm (d) 10 cm

159. If length of a rectangle becomes three times and breadth is decreased to its half, then the ratio of the area of given rectangle to the area of new rectangle is:

SSC CGL 13/08/2021 (Shift-02)

(a) 3 : 2 (b) 3 : 1
(c) 2 : 3 (d) 1 : 3

160. The cost of tilling the floor of a rectangular room is ₹9100 at ₹65 per m². The ratio of the length and breadth of the floor is 7 : 5. The perimeter (in m) of the floor of the room is:

SSC CGL 18/08/2021 (Shift-02)

(a) 48 (b) 24
(c) 36 (d) 28.8

161. The area of a triangular plot having sides 12 m, 35 m and 37 m is equal to the area of a rectangular field whose sides are in the ratio 7 : 3. The perimeter (in m) of the field is:

SSC CGL 20/08/2021 (Shift-03)

(a) $24\sqrt{10}$ (b) $20\sqrt{10}$
(c) $20\sqrt{5}$ (d) $24\sqrt{5}$

162. The area of a triangular field whose sides are 65m, 72, and 97m is equal to the area of a rectangular park whose sides are in the ratio of 5 : 13. What is the perimeter (in m) of the rectangular park?

SSC CHSL 19/04/2021 (Shift-01)

(a) 108 (b) 180
(c) 216 (d) 144

163. The area of a triangular park with sides 88 m, 165 m, and 187 m is equal to the area of a rectangular plot whose sides are in the ratio 5 : 3. What is the perimeter (in m) of the plot?

ICAR Mains 07/07/2023 (Shift-01)

(a) 352 (b) 384
(c) 400 (d) 320

164. A rectangular courtyard is 4m 95cm long and 16m 65cm broad. It is to be paved with the square tiles of the same size. Find the least number of such square tiles required to pave the rectangular courtyard.

SSC CGL 11/09/2024 (Shift-01)

(a) 877 (b) 944
(c) 388 (d) 407

165. A rectangular lawn whose length is twice of its breadth is extended by having four semi-circular portions on its sides. What is the total area (in m²) of the lawn if the smaller side of the rectangle is 12 m? (Take π = 3.14)

SSC CPO 24/11/2020 (Shift-01)

(a) 548.32 (b) 444
(c) 853.2 (d) 308.64

166. A rectangle with the largest area is cut out of a circle with radius 5 units. What is the area of the remaining portion?

SSC CHSL 10/07/2024 (Shift-01)

(a) 25(2π – 3) (b) 25(π – 2)
(c) 25(2π – 5) (d) 25(π – 3)

167. The length and the breadth of the floor of a rectangular hall are 126 feet and 90 feet, respectively. What will be the area (in square feet) of each of the largest identical square tiles that can be used to tile this floor in a way that no part of the floor remains uncovered?

SSC CPO 03/10/2023 (Shift-03)

(a) 196 feet² (b) 256 feet²
(c) 324 feet² (d) 484 feet²

168. A path of uniform width 2.5 m runs around the outside of a rectangular field of dimensions 45 m × 35 m. What is the area of the path (in m²)?

SSC MTS 08/09/2023 (Shift-02)

(a) 525 m² (b) 475 m²
(c) 500 m² (d) 425 m²

169. There is a rectangular garden of 240 meters × 80 meters. A path of width 4 meter is build outside the garden along its four sides. What is the area of the path?

SSC CHSL 10/03/2023 (Shift-04)

(a) 2826 m² (b) 2542 m²
(c) 2916 m² (d) 2624 m²

◆ TYPE – VI ◆
SQUARE

170. If the perimeter of a square is 64 cm, what would be its area?

SSC CHSL 03/07/2024 (Shift-03)

(a) 256 cm² (b) 206 cm²
(c) 216 cm² (d) 266 cm²

171. Find the area of a square, one of whose diagonals is 4.8 m long.

SSC CGL 11/09/2024 (Shift-02)

(a) 12.5m² (b) 10.5m²
(c) 9.5m² (d) 11.52m²

172. The side of a square is 5 cm. If the side is doubled, by how many times will the area of the square increase?

SSC CHSL 26/05/2022 (Shift-03)

(a) 3 Times (b) 2 Times
(c) 5 Times (d) 4 Times

173. The diagonal of the square is $8\sqrt{2}$ cm. Find the diagonal of another square whose area is triple that of the first square.

SSC CGL 06/12/2022 (Shift-04)

(a) $8\sqrt{5}$ cm (b) $8\sqrt{3}$ cm
(c) $8\sqrt{2}$ cm (d) $8\sqrt{6}$ cm

174. A man walking at a speed of 3 km/h crosses a square field diagonally in 5 minutes. What is the area of the field (in m²)?

SSC CGL 24/08/2021 (Shift-02)

(a) 3125 (b) 31.25
(c) 31250 (d) 312.5

175. The width of the path around a square field is 4.5 m and its area is 105.75 m². Find the cost of fencing the field at the rate of ₹100 per meter.

SSC CGL 11/04/2022 (Shift-02)

(a) ₹550 (b) ₹600
(c) ₹275 (d) ₹400

176. Using the mid points of sides of a square with an area of 36 square units, another square is made. What is the area of a new square made (in square units)?

SSC MTS 05/09/2023 (Shift-02)

(a) 27sq. units (b) 18 sq. units
(c) 21sq. units (d) 24 sq. units

177. Nine times the area of a circle is same as the three times the area of a square. What is the ratio of the diameter of the circle and diagonal of the square?

SSC MTS 16/05/2023 (Shift-02)

(a) $\sqrt{2} : \sqrt{3\pi}$ (b) $2 : \sqrt{3\pi}$
(c) $2 : 3\pi$ (d) $\sqrt{5} : \sqrt{7\pi}$

178. The perimeter of a square whose area is the same as the area of a semi-circle of radius $2\sqrt{2}$ cm is:

SSC CHSL 08/07/2024 (Shift-02)

(a) $4\sqrt{\pi}$ cm (b) $16\sqrt{\pi}$ cm
(c) $8\sqrt{2\pi}$ cm (d) $8\sqrt{\pi}$ cm

179. The perimeter of a rectangle is equal to the perimeter of a square. If the length and the breadth of the rectangle are 10 cm and 8 cm respectively, then what will be the area of the square?

SSC CPO 09/11/2022 (Shift-03)

(a) 72 cm² (b) 98 cm²
(c) 81 cm² (d) 64 cm²

180. The area of a square is S, and that of the square formed by joining the mid-points of the given square is A. The value of $\frac{A}{S}$ is equal to:

SSC MTS 05/10/2021 (Shift-01)

(a) 0.125 (b) 0.25
(c) 1.25 (d) 0.5

181. Find the area of a circle whose radius is equal to the side of a square whose perimeter is 196 m.

SSC CHSL 20/03/2023 (Shift-03)

(a) 7457 m² (b) 7546 m²
(c) 6477 m² (d) 8844 m²

182. The area of a triangle is half the area of a square. The perimeter of the square is 172cm. What is the area of the triangle (in cm²)

SSC CHSL 04/08/2023 (Shift-04)

(a) 924.5 (b) 1984
(c) 1849 (d) 992

183. The area of a square is 1156 cm². What is the respective ratio between the length and the breadth of a rectangle whose length is twice the side of the square and whose breadth is 14 cm less than the side of the square?

SSC CHSL 20/03/2023 (Shift-04)

(a) 16 : 7 (b) 19 : 5
(c) 17 : 5 (d) 21 : 19

184. The length of each side of a square is twice the radius of a circle. If the radius of the circle is 7 cm, then what is the difference between the areas of the square and the circle? [Take π = 22/7]

SSC MTS 07/07/2022 (Shift-01)

(a) 44 cm² (b) 46 cm²
(c) 42 cm² (d) 48 cm²

185. Each side of a square is 12 cm long. The perimeter of this square is equal to the perimeter of a rectangle whose length is 16 cm. What will be the area of this rectangle?

SSC MTS 12/07/2022 (Shift-02)

(a) 128 cm² (b) 112 cm²
(c) 184 cm² (d) 156 cm²

186. What is the area (in cm²) of a circle inscribed in a square of area 784 cm²? [Take π = 22/7]

SSC CGL 16/08/2021 (Shift-01)

(a) 660 (b) 616
(c) 924 (d) 462

187. The area of a square shaped field is 1764 m². The breadth of a rectangular park is $\frac{1}{3}$ rd the side of the square field and its length is two times its breadth. What is the cost (in ₹) of leveling the park at ₹15 per m²?

SSC CGL 16/08/2021 (Shift-03)

(a) ₹4200 (b) ₹4290
(c) ₹5880 (d) ₹4320

188. A square has the perimeter equal to the circumference of a circle having radius 7 cm. What is the ratio of the area of the circle to area of the square?

SSC CGL 23/08/2021 (Shift-02)

(a) 7 : 2 (b) 14 : 11
(c) 7 : 11 (d) 121 : 44

189. The base of a triangle is equal to the perimeter of a square whose diagonal is $7\sqrt{2}$ cm and its height is equal to the side of a square whose area is 169 m². The area (in cm²) of the triangle is:

SSC CHSL 06/08/2021 (Shift-02)

(a) 156 (b) 175
(c) 130 (d) 182

190. The base of a triangle is equal to the perimeter of a square whose diagonal is $6\sqrt{2}$ cm, and its height is equal to the side of a square whose area is 144 cm². The area of the triangle (in cm²) is:

SSC CPO 24/11/2020 (Shift-02)

(a) 288 cm² (b) 216 cm²
(c) 144 cm² (d) 72 cm²

191. A wire is in the form of square with side 11 cm. It is bent to form a circle. What is the radius of the circle?

SSC CGL 06/12/2022 (Shift-01)

(a) 11 cm (b) 5 cm
(c) 9 cm (d) 7 cm

192. The diagonal of a square A is (a + b) units. What will be the area (in square units) of the square drawn on the diagonal of square B, whose area is twice the area of square A?

SSC CGL 05/03/2020 (Shift-01)

(a) $(a + b)^2$ (b) $2(a + b)^2$
(c) $4(a + b)^2$ (d) $8(a + b)^2$

• TYPE – VII •
PARALLELOGRAM

193. The area of a parallelogram with base 26 cm and height 18 cm is:

SSC CGL 19/09/2024 (Shift-01)

(a) 234 cm² (b) 936 cm²
(c) 932 cm² (d) 468 cm²

194. The base of a parallelogram is twice its height. If the area of the parallelogram is 338 cm², then find its height (in cm).

SSC CPO 27/06/2024 (Shift-01)

(a) 13 (b) 11
(c) 14 (d) 12

195. The base of a parallelogram is thrice its height. If the area of the parallelogram is 1020 cm², then what is its height?

SSC Phase-XII 25/06/2024 (Shift-02)

(a) $2\sqrt{85}$ cm (b) $2\sqrt{84}$ cm
(c) $\sqrt{89}$ cm (d) $\sqrt{82}$ cm

196. The perimeter of a parallelogram is 48 cm. If the height of the parallelogram is 6 cm and the length of the adjacent side is 8 cm. find its area.

SSC CHSL 03/08/2023 (Shift-01)

(a) 90 cm² (b) 80 cm²
(c) 84 cm² (d) 96 cm²

197. The two adjacent sides of a parallelogram are 12 cm and 5 cm respectively. If one of the diagonals is 13 cm long, then what is the area of the parallelogram?

SSC MTS 04/05/2023 (Shift-02)

(a) 60 cm² (b) 30 cm²
(c) 75 cm² (d) 25 cm²

198. In a parallelogram, one of the parallel sides is 16 cm and the other side is 12 cm. If the perpendicular distance between the two parallel sides of dimension 16 cm is 24 cm, then the perpendicular distance between its other two parallel sides is:

SSC Phase-XI 27/06/2023 (Shift-02)

(a) 16 cm (b) 12 cm
(c) 32 cm (d) 24 cm

• TYPE – VIII •
RHOMBUS

199. Find the area of a rhombus whose diagonals are of lengths 10 cm and 8.2 cm.

SSC CHSL 04/07/2024 (Shift-02)

(a) 43 cm² (b) 41 cm²
(c) 40 cm² (d) 42 cm²

200. Find the area (in cm²) of the rhombus, lengths of whose diagonals are, respectively, 7.5 cm and 5.6 cm.

SSC MTS 11/09/2023 (Shift-03)

(a) 30 cm² (b) 27 cm²
(c) 21 cm² (d) 28 cm²

201. If the diagonals of a rhombus are 10 cm and 24 cm., then what is the perimeter of the rhombus?

SSC CHSL 16/03/2023 (Shift-01)

(a) 50 cm (b) 60 cm
(c) 56 cm (d) 52 cm

202. If the area of rhombus is 70m² and height is 5 m, its perimeter is ------.

SSC CHSL 11/07/2024 (Shift-02)

(a) 56 m (b) 35 m
(c) 64 m (d) 25 m

203. The area of the rhombus (in cm²) having each side equal to 13 cm and one of its diagonals equal to 24 cm is:

SSC Phase-XII 20/06/2024 (Shift-03)

(a) 120 (b) 60
(c) 110 (d) 130

204. Find the area of a rhombus if the perimeter of the rhombus is 52 cm, and one of its diagonals is 10 cm long.

SSC CPO 03/10/2023 (Shift-03)

(a) 164 cm² (b) 144 cm²
(c) 160 cm² (d) 120 cm²

205. The area of a rhombus having one side measuring 17 cm and one diagonal measuring 16 cm is:

SSC CPO 04/10/2023 (Shift-03)

(a) 280 cm² (b) 210 cm²
(c) 180 cm² (d) 240 cm²

206. One of the diagonals of a rhombus is 70 percent of the other diagonal. What is the ratio of the area of rhombus to the square of the length of the larger diagonal?

SSC MTS 15/06/2023 (SHIFT-02)

(a) 5 : 17 (b) 7 : 20
(c) 6 : 19 (d) 20 : 7

207. The length of the diagonals of a rhombus is 40 cm and 60 cm. What is the length of the side of the rhombus?

SSC CHSL 13/03/2023 (Shift-04)

(a) $50\sqrt{3}$ cm (b) $20\sqrt{3}$ cm
(c) $10\sqrt{13}$ cm (d) $40\sqrt{13}$ cm

208. If the sum of the diagonals of a rhombus is L and the perimeter is 4P, then find the area of the rhombus?

SSC CPO 11/11/2022 (Shift-01)

(a) $\frac{1}{4}(L^2 - P^2)$ (b) $\frac{1}{4}(L^2 - 4P^2)$
(c) $\frac{1}{2}(L^2 - 4P^2)$ (d) $\frac{1}{4}(L^2 + 3P^2)$

209. What is the area (in hectares) of a rhombus-shaped field whose side is 146 m and one of its diagonals is 192 m?

SSC PHASE-IX 2022

(a) 2.121 (b) 2.112
(c) 2.012 (d) 2.102

210. The perimeter of a field in the shape of a rhombus is 800 m and one of its diagonals is 240 m. What is the area (in m²) of the field?

SSC PHASE-IX 2022

(a) 57600 (b) 28800
(c) 38400 (d) 19200

211. Length of each side of a rhombus is 13 cm and one of the diagonal is 24 cm. What is the area (in cm²) of the rhombus?

SSC CGL 13/08/2021 (Shift-01)

(a) 240 (b) 60
(c) 300 (d) 120

212. A square and a rhombus have the same base and the rhombus is inclined at 45°, then what will be the ratio of the area of the square to the area of the rhombus?

SSC MTS 14/09/2023 (Shift- 03)

(a) $1 : \sqrt{3}$ (b) $\sqrt{2} : \sqrt{3}$
(c) $\sqrt{3} : 1$ (d) $\sqrt{2} : 1$

• TYPE – IX •
TRAPEZIUM

213. The two parallel sides of a trapezium are 17 cm and 15 cm, respectively. If the height of the trapezium is 6 cm, then its area (in m²) is:

SSC CPO 24/11/2020 (Shift-01)

(a) 9.6 (b) 960
(c) 0.96 (d) 0.0096

214. The distance between the parallel sides of a trapezium is 18 cm. If the area of the trapezium is 1188 cm², then what is the sum of the lengths of the parallel sides?

SSC CPO 28/06/2024 (Shift-03)

(a) 150 cm (b) 115 cm
(c) 126 cm (d) 132 cm

215. The area of a trapezium shaped field is 1720 m², the distance between its parallel sides is 40 m and the length of one of the parallel sides is 48 m. What is the length (in m) of the other parallel side?

SSC MTS 01/09/2023 (Shift-02)

(a) 38 m (b) 34 m
(c) 42 m (d) 56 m

216. A trapezium plate having two parallel sides of length 15 cm and 9 cm and distance between them is 6 cm. Copper plating is to be done on the plate at a rate of ₹3 per square cm. What will be the total cost of copper plating on the upper side of the plate?

SSC CHSL 21/03/2023 (Shift-01)

(a) ₹432 (b) ₹72
(c) ₹216 (d) ₹108

217. A farmer's land is in the shape of a trapezium which has its parallel sides measuring 6.32 yards and 7.68 yards and the distance between the parallel sides is 5.50 yards. The cost of ploughing the land is Rs 1200 per square yard. What amount have to be spent in order to plough the entire land?

SSC MTS 03/05/2023 (Shift-02)

(a) ₹36600 (b) ₹32500
(c) ₹55400 (d) ₹46200

MENSURATION-3D

• TYPE – I •
CUBE

218. If the side of a cubical box is 12 cm, then find its total surface area.

SSC CGL 26/07/2023 (Shift-03)

(a) 952 cm² (b) 864 cm²
(c) 664 cm² (d) 792 cm²

219. The total surface area of a closed cube is given as 1152 cm². What is the length (in cm) of each side of the cube?

SSC CGL 19/09/2024 (Shift-03)

(a) $9\sqrt{2}$ (b) $4\sqrt{13}$
(c) $8\sqrt{3}$ (d) $8\sqrt{2}$

220. The longest diagonal of a cube is $6\sqrt{3}$ cm. Find the total surface area of the cube.

SSC MTS 13/09/2023 (Shift-03)

(a) 324 cm² (b) 216 cm²
(c) 648 cm² (d) 36 cm²

221. The surface area of a cube is 13.5 m². What is the length (in m) of its diagonal?

SSC CGL 24/08/2021 (Shift-03)

(a) $2\sqrt{3}$ (b) 1.5
(c) 2 (d) $1.5\sqrt{3}$

222. The difference between the total surface area and lateral surface area of a cube, if side of the cube is 11 cm (in square cm), is ________.

SSC Phase-XII 26/06/2024 (Shift-03)

(a) 242 (b) 243
(c) 241 (d) 244

223. The length of the side of a cube is 8 cm. Find the volume of the cube?

SSC CPO 28/06/2024 (Shift-01)

(a) 612 cm³ (b) 512 cm³
(c) 664 cm³ (d) 564 cm³

224. What is the length (in cm) of each side of a cube if the volume of a cube is 13,824 cm³?

SSC CGL 24/09/2024 (Shift-02)

(a) 20.4 (b) 24
(c) 22 (d) 34

225. The length of longest diagonal of a cube is $7\sqrt{3}$ cm. Find its volume (in cm³).

SSC CGL 25/07/2023 (Shift-04)

(a) $343\sqrt{3}$ (b) $49\sqrt{3}$
(c) 334 (d) 343

226. The surface area of a cube is 1728 cm². Find its volume.

SSC CHSL TIER-II (18/11/2024)

(a) $3456\sqrt{2}$ cm³ (b) $4356\sqrt{2}$ cm³
(c) $6453\sqrt{2}$ cm³ (d) $5436\sqrt{2}$ cm³

227. The surface area of a cube is 486 cm². Find the volume

SSC CHSL 01/07/2024 (Shift-01)

(a) 512 cm³ (b) 625 cm³
(c) 729 cm³ (d) 486 cm³

228. If lateral surface area of a cube is 144 cm², then find its volume.

SSC CHSL 09/07/2024 (Shift-01)

(a) 216 cm³ (b) 117.58 cm³
(c) 1728 cm³ (d) 864 cm³

229. The whole surface area of a cube is 294 cm². The volume of the cube is:

SSC CHSL 05/07/2024 (Shift-04)

(a) 243 cm³ (b) 343 cm³
(c) 216 cm³ (d) 512 cm³

230. If the total surface area of a cube is 24 sq.units, then what is the volume of the cube?

SSC CGL 14/07/2023 (Shift-02)

(a) 8 cu.units (b) 16 cu.units
(c) 10 cu.units (d) 4 cu.units

231. The volume of a cube is 64 cm³. The total surface area of the cube is:

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 16 cm² (b) 96 cm²
(c) 64 cm² (d) 128 cm²

232. If the volume of a cube is given as 12167 cm³, then the surface area of the cube will be:

SSC Phase-XI 27/06/2023 (Shift-04)

(a) 3475 cm² (b) 4574 cm²
(c) 3174 cm² (d) 5413 cm²

233. The volume of a cube is reduced to 72.9%. By how much is the side of the cube reduced?

SSC CHSL 02/07/2024 (Shift-02)

(a) 9.5% (b) 10%
(c) 8.5% (d) 9%

234. Two cubes have their volumes in the ratio 1 : 125. Find the ratio of their surface areas.

SSC CHSL 09/07/2024 (Shift-02)

(a) 1 : 25 (b) 25 : 1
(c) 1 : 5 (d) 1 : 125

235. What is the edge of a cube whose volume is equal to the sum of the volumes of the cubes of edge 6 cm, 8 cm and 10 cm?

SSC CGL 01/12/2022 (Shift-04)

(a) 5 cm (b) 3 cm
(c) 6 cm (d) 12 cm

236. If the side of a cube is 3,which of the following options is equal to the ratio between the surface area and the volume of the cube?

SSC CHSL 01/07/2024 (Shift-04)

(a) 2 : 7 (b) 2 : 3
(c) 2 : 1 (d) 2 : 5

237. A cube of edge 4 cm is cut into cubes each of edge of 2 cm. The ratio of the total surface area of one of the small cubes to that of the large cube is equal to:

SSC CHSL 10/07/2024 (Shift-02)

(a) 1 : 64 (b) 1 : 16
(c) 1 : 4 (d) 1 : 8

238. What is the volume of a cube if the perimeter of one face of the cube is 40 cm?

SSC CGL 17/07/2023 (Shift-03)

(a) 1000 cm³ (b) 820 cm³
(c) 600 cm³ (d) 800 cm³

239. A cube of side 5 cm is made using 125 cubes, each of side 1 cm. A cube is removed from the middle of each of the faces. What will be the surface area (in cm^2) of the remaining solid?

SSC CHSL TIER-II 26/06/2023

(a) 150 (b) 174
(c) 155 (d) 144

240. A hollow cube is made of paper to have a volume of 512 cubic units. How much paper in square units will be required to make the cube?

SSC CHSL TIER-II 10/01/2024

(a) 384 (b) 328
(c) 348 (d) 288

• TYPE – II •
CUBOID

241. Find the total surface area (in cm^2) of a cuboid having dimensions 5 cm, 7 cm and 11 cm.

SSC CGL 20/07/2023 (Shift-02)

(a) 385 (b) 334
(c) 343 (d) 167

242. Find the surface area (in m^2) of a cuboid that is 11 m long, 7 m broad and 4 m high.

SSC CPO 29/06/2024 (Shift-02)

(a) 298 (b) 320
(c) 249 (d) 289

243. The dimensions of a cuboid are 8 cm, 12 cm and 14 cm. Find the total surface area.

SSC Phase-XII 20/06/2024 (Shift-02)

(a) 753 cm^2 (b) 754 cm^2
(c) 752 cm^2 (d) 751 cm^2

244. Find the whole surface area of a cuboid having a length of 19 cm, breadth of 9 cm and height of 4.5 cm.

SSC CHSL 11/07/2024 (Shift-03)

(a) 497 cm^2 (b) 917 cm^2
(c) 619 cm^2 (d) 594 cm^2

245. The length, width and height of a cuboidal box are 18 cm, 12 cm and 10 cm, respectively. What is the total surface area of the box?

SSC CHSL 13/03/2023 (Shift-03)

(a) 1000 cm^2 (b) 1048 cm^2
(c) 1032 cm^2 (d) 1120 cm^2

246. Area of a cardboard (in cm^2) needed to make a closed box of size 20 cm × 10 cm × 8 cm will be:

SSC CGL 18/04/2022 (Shift-03)

(a) 960 (b) 690
(c) 880 (d) 750

247. If the surface area of cuboid is 108 m^2, then find the height of the cuboid, whose length is 6 m and breadth is 3 m.

SSC CHSL 03/07/2024 (Shift-02)

(a) 4.5 m (b) 4 m
(c) 5 m (d) 5.5 m

248. If the length, breadth and total surface area of a cuboid are 30 cm, 20 cm and 2600 cm^2, respectively, then find its height.

SSC CHSL 05/07/2024 (Shift-03)

(a) 30 cm (b) 15 cm
(c) 50 cm (d) 14 cm

249. The length of a cuboid is 4 cm. If the breadth of the cuboid is four times of its length and height of the cuboid is twice of its length, then what is the lateral surface area of the cuboid?

SSC MTS 15/06/2023 (Shift-02)

(a) 380 cm^2 (b) 440 cm^2
(c) 260 cm^2 (d) 320 cm^2

250. The length of a cuboid is 10 cm. If the breadth of the cuboid is half of its length and height of the cuboid is twice of its length, then what is the lateral surface area of the cuboid?

SSC MTS 16/06/2023 (Shift-03)

(a) 600 cm^2 (b) 500 cm^2
(c) 720 cm^2 (d) 560 cm^2

251. Find the surface area (in cm^2) of a cardboard box in the shape of a cuboid whose length is 60 cm breadth is half its length and height is one-third of its breadth.

SSC CHSL 11/07/2024 (Shift-01)

(a) 2700 (b) 8100
(c) 5400 (d) 10800

252. The length of a cuboid is thrice of its breadth and the height of cuboid is twice of its breadth. If the breadth of the cuboid is 6 cm, then what is the total surface area of cuboid?

SSC CHSL 15/03/2023 (Shift-04)

(a) 844 cm^2 (b) 708 cm^2
(c) 762 cm^2 (d) 792 cm^2

253. The length of a cold storage is 5 times its breadth and its height is 8 m. The area of its four walls (including the doors) is 720 m^2. Find the total surface area of cold storage.

SSC CPO 10/11/2022 (Shift-02)

(a) 1290.6 m^2 (b) 1275.3 m^2
(c) 1265.25 m^2 (d) 1282.5 m^2

254. The length of a cuboid is 8 cm. If the breadth of the cuboid is twice of its length and height of the cuboid is half of its Length, then what is the total surface area of the cuboid?

SSC CHSL 17/03/2023 (Shift-01)

(a) 448 cm^2 (b) 216 cm^2
(c) 188 cm^2 (d) 154 cm^2

255. The sum of the length and the breadth of a cuboid is 4 cm. Length is three times of breadth. If the height of the cuboid is half of the sum of its length and breadth, then what is the total surface area of the cuboid?

SSC CHSL 20/03/2023 (Shift-02)

(a) 64 cm^2 (b) 22 cm^2
(c) 32 cm^2 (d) 30 cm^2

256. If the areas of three adjacent faces of a cuboid are 5cm^2, 15cm^2, 27cm^2, respectively, the surface area of the cuboid is:

SSC CHSL 09/07/2024 (Shift-01)

(a) 45 cm^2 (b) 75 cm^2
(c) 47 cm^2 (d) 94 cm^2

257. The length, breadth and height of a room are 7 m and 5 m and 3 m, respectively. Find the cost of whitewashing the walls of the room and the ceiling at the rate of ₹16 per m^2.

SSC CHSL 03/08/2023 (Shift-03)

(a) ₹1,712 (b) ₹1,742
(c) ₹1,698 (d) ₹1,684

258. The internal measures of a cuboidal room are with length as 12 m, breadth as 8 m and height as 10 m. The total cost (in ₹) of whitewashing all four walls of the room and also the ceiling of the room, if the cost of whitewashing is ₹25 per m^2 is:

SSC CPO 24/11/2020 (Shift-02)

(a) 12,400 (b) 12,000
(c) 18,000 (d) 13,600

259. The length, breadth and height of a room is 15 m, 9 m, and 5 m, respectively. From each can of paint 40 square metre of area is painted. How many cans of paint will be needed to paint only the walls of the room?

SSC CGL 23/09/2024 (Shift-02)

(a) 12 (b) 6
(c) 4 (d) 8

260. A cuboid with dimensions 20cm, 12cm, and 10 cm is cut into 8 identical pieces by 3 cuts. What will be the total surface area of all the pieces?

SSC CHSL 10/07/2024 (Shift-03)

(a) 1680 cm^2 (b) 3360 cm^2
(c) 2240 cm^2 (d) 1220 cm^2

261. Find the length of the longest diagonal (in cm) of a cuboidal box of dimensions 1.2 cm × 1.3 cm × 1.5 cm (correct to two decimal places).

SSC CGL 17/09/2024 (Shift-03)

(a) 2.22 cm (b) 2.32 cm
(c) 2.23 cm (d) 2.35 cm

262. Find the length of the longest stick that can be fitted in a cubical vessel of edge 70 cm?

SSC CGL 23/09/2024 (Shift-01)

(a) $35\sqrt{3}$ cm (b) $70\sqrt{3}$ cm
(c) $10\sqrt{3}$ cm (d) $70\sqrt{2}$ cm

263. The sum of length, breadth and height of a cuboid box is 20 cm and the total surface area of cuboid is 256 sq. cm. What is the maximum length (in approximate) of a stick that can be placed inside the cuboid box?

SSC CHSL 13/03/2023 (Shift-02)

(a) 16 cm (b) 24 cm
(c) 32 cm (d) 12 cm

264. The sum of length, breadth and height of a cuboid is 20 cm. If the length of the diagonal is 12 cm, then find the total surface area of the cuboid.

SSC CGL TIER-II 18/11/2020)

(a) 264 cm^2 (b) 364 cm^2
(c) 356 cm^2 (d) 256 cm^2

265. The sum of the length, breadth and depth of a cuboid is 23 cm, and its diagonal is $5\sqrt{7}$ cm. Its surface area is:

SSC CHSL 31/05/2022 (Shift-01)

(a) 288 cm^2 (b) 354 cm^2
(c) 372 cm^2 (d) 222 cm^2

266. The dimensions of a pond are 20 m, 14 m and 6 m. Find the capacity of the pond.

SSC Phase-XII 21/06/2024 (Shift-03)

(a) 1680m^3 (b) 1520m^3
(c) 1280m^3 (d) 1460m^3

267. A pond is 50 m long, 35 m wide and 2.5 m deep. Find the capacity of the pond.
SSC CHSL 25/05/2022 (Shift-02)
(a) 4165 m^3 (b) 4375 m^3
(c) 4165 m^3 (d) 3850 m^3

268. The volume of a wall six times as high as its breadth and length half as long as its height, is 23,958 cm^3. What is the breadth of the wall?
SSC CPO 10/11/2022 (Shift-01)
(a) 21 cm (b) 15 cm
(c) 11 cm (d) 18 cm

269. Volume of a cuboid is 4800 cm^3. If the height of this cuboid is 20 cm, then what will be the area of the base of cuboid?
SSC CGL TIER-II (08/08/2022)
(a) 480 cm^2 (b) 150 cm^2
(c) 240 cm^2 (d) 120 cm^2

270. A cuboidal water purifier can carry 10 litres of water. Its breadth is $\frac{1}{5}$ of its height and length is $\frac{1}{3}$ of the sum of the breadth and height. The height of the tank is:
SSC CHSL 10/07/2024 (Shift-01)
(a) 80 cm (b) 10 cm
(c) 20 cm (d) 50 cm

271. If the areas of three adjacent faces of a cuboidal box are 729 cm^2, 529 cm^2 and 289 cm^2, respectively, then find the volume of the box.
SSC CHSL 03/06/2022 (Shift-03)
(a) 10557 cm^3 (b) 10560 cm^3
(c) 10555 cm^3 (d) 10551 cm^3

272. The area of three adjacent faces of a cuboidal box is 120 cm^2, 72 cm^2 and 60 cm^2, respectively. Find the volume(in cm^3) of the box.
SSC CHSL 09/07/2024 (Shift-03)
(a) 864 (b) 720
(c) 425 (d) 650

273. The areas of three adjacent faces of a cuboid are p, q and r unit², respectively. What is its volume?
SSC MTS 06/09/2023 (Shift-03)
(a) $\sqrt[3]{pqr}$ unit³ (b) $\sqrt{pqr}$ unit³
(c) $p^3q^3r^3$ unit³ (d) p q r unit³

274. If the length of the longest diagonal of a cubical box is $\sqrt{300}$ cm, find its volume.
SSC MTS 11/09/2023 (Shift-02)
(a) 10000 cm^3 (b) 1000 cm^3
(c) 100 cm^3 (d) 400 cm^3

275. Two cubes, each of edge 5 cm, are joined face to face. Find the surface area of the cuboid thus formed.
SSC CHSL 08/07/2024 (Shift-04)
(a) 300 cm^2 (b) 125 cm^2
(c) 200 cm^2 (d) 250 cm^2

276. Three cubes each of side 5 cm are joined end to end. The surface area of the resulting cuboid is:
SSC CHSL 11/07/2024 (Shift-02)
(a) 150 cm^2 (b) 175 cm^2
(c) 350 cm^2 (d) 75 cm^2

277. 2 cubes each of volumes 125 cm^3 are joined end to end. The surface area of the resulting cuboid is:
SSC MTS 18/05/2023 (Shift-01)
(a) 325 cm^2 (b) 350 cm^2
(c) 125 cm^2 (d) 250 cm^2

278. If three cubes of volume 512 cm^3 each are joined end to end, find the surface area of the resulting cuboid?
SSC CGL 18/09/2024 (Shift-01)
(a) 896 cm^2 (b) 986 cm^2
(c) 895 cm^2 (d) 869 cm^2

279. Four cubes each of volume 216 cubic cm are joined end to end to form a new solid. The surface area of the new solid is:
SSC CHSL 03/07/2024 (Shift-04)
(a) 1296 sq. cm (b) 648 sq. cm
(c) 672 sq. cm (d) 324 sq. cm

280. Four solid cubes, each of volume 1728 cm^3, are kept in two rows having two cubes in each row. They form a rectangular solid with square base. The total surface area (in cm^2) of the resulting solid is:
SSC MTS 18/10/2021
(a) 576 (b) 1152
(c) 2304 (d) 1440

281. Three cubes of equal volume are joined end to end. Find the surface area of the resulting cuboid if the diagonal of the cube is $6\sqrt{3}$ cm.
SSC CGL 05/12/2022 (Shift-04)
(a) 509 cm^2 (b) 504 cm^2
(c) 516 cm^2 (d) 512 cm^2

282. The length, breadth and height of a cuboid are in ratio of 3 : 4 : 5. If the volume of the cuboid is 1620 m^3, find the total surface area of the cuboid.
SSC CHSL 05/07/2024 (Shift-01)
(a) 646 m^2 (b) 846 m^2
(c) 423 m^2 (d) 712 m^2

283. The sides of a cuboid are in the ratio 3 : 4 : 5 and its surface area is equal to the surface area of the cube with side 6units. What is the approximate volume of the cuboid?
SSC CHSL 01/07/2024 (Shift-02)
(a) 210 (b) 150
(c) 240 (d) 180

284. The ratio of length, breadth, and height of a solid cuboid is given as 3 : 2 : 1, and breadth of this cuboid is given as 12 cm. Find the volume (in cm^3) of the cuboid.
SSC CGL 24/09/2024 (Shift-03)
(a) 1250 (b) 1296
(c) 1200 (d) 1500

285. The volume of rectangular block is 12288 m^3. Its dimension are in the ratio of 4 : 3 : 2. If the entire surface is polished at the rate of 2 paise per m^2, then find the total cost of polishing
SSC CHSL 11/07/2024 (Shift-04)
(a) ₹33.28 (b) ₹44.42
(c) ₹66.56 (d) ₹11.14

286. The edges of a rectangular box in the ratio 3 : 5 : 8, and its surface area is 632 cm^2. What will be the volume of the box?
SSC CHSL 04/07/2024 (Shift-01)
(a) 801 cm^3 (b) 990 cm^3
(c) 510 cm^3 (d) 960 cm^3

287. The breadth of a room is twice its height and half its length. The volume of the room is 1728 m^3. The length of the room is:
SSC CPO 29/06/2024 (Shift-01)
(a) 20 m (b) 24 m
(c) 34 m (d) 28 m

288. The ratio of the length, width and height of a closed cuboid is given as 6 : 3 : 2. The total surface area of this cuboid is given as 1800 cm^2. Find the volume (in cm^3) of this cuboid.
SSC CGL TIER-II 26/10/2023
(a) 4650 (b) 4500
(c) 4200 (d) 4800

289. If the volume of one brick is 0.0014 m^3, then how many bricks will be required to construct a wall of length 14 m, breadth 0.125 m and height 5 m?
SSC CGL 21/07/2023 (Shift-03)
(a) 5250 (b) 3250
(c) 6250 (d) 4250

290. A petrol tank is of length 50 m, breadth 25 m, and depth 10 m. How many liters of petrol can be accommodated in the petrol tank when it is completely filled?
SSC CGL 26/07/2023 (Shift-02)
(a) 1,25,00,000 (b) 12,50,000
(c) 1,25,000 (d) 12500

291. To pack a set of books, Surbhi made a carton that was 48 inches long, 27 inches wide and 30 inches tall. What will be the total surface area (in square feet) of this carton, once it closed from all sides? [Use 1 foot = 12 inches]
SSC Phase-XI 30/06/2023 (Shift-04)
(a) 49.25 (b) 48.25
(c) 48.75 (d) 49.75

292. If the brick size is 25 cm × 12 cm × 9 cm, then how many bricks are required to construct a wall of length 10 m, breadth 22.5 cm and height 6 m?
SSC CHSL 02/07/2024 (Shift-02)
(a) 8000 (b) 4500
(c) 6000 (d) 5000

293. An article is of size 9 cm × 6 cm × 3 cm. The number of such articles that can be packed in a box measuring 63cm × 42 cm × 21 cm is:
SSC CHSL 10/07/2024 (Shift-03)
(a) 343 (b) 49
(c) 196 (d) 243

294. The internal length, breadth and height of a cardboard box are 6 cm, 10 cm and 12 cm, respectively. How many boxes are needed in which cubes whose volume is 2160 cm^3 can be packed?
SSC CHSL 03/07/2024 (Shift-01)
(a) 4 (b) 3
(c) 6 (d) 5

295. The measurement of a right rectangular box is of length 1.6m, width 90 cm, height 60 cm. Soap cakes of dimensions 6 cm × 5 cm × 40 mm are to be packed in boxes in such a way that there is no empty space left in the box. How many cakes can be packed in a box?

SSC CHSL TIER-II 10/01/2024

(a) 6500 (b) 5600
(c) 6000 (d) 7200

296. The volume of a wall whose height is 10 times its width and whose length is 8 times its height is 51.2 m^3. What is the cost (in ₹) of painting the wall on one side at the rate of ₹100/m^2?

SSC CGL 20/08/2021 (Shift-02)

(a) 12750 (b) 12500
(c) 12800 (d) 12250

297. A rectangular sheet of metal is 60 cm by 25 cm. Equal squares of side 5 cm are cut off at the corners and the remainder is folded up to form an open rectangular box. Find the volume of the box.

SSC CPO 27/06/2024 (Shift-03)

(a) 2750 cm^3 (b) 5750 cm^3
(c) 3750 cm^3 (d) 4750 cm^3

298. An iron box with external dimensions 60 cm, 40 cm, and 20 cm is made of 1 cm thick sheet. If 1 cm^3 of iron weighs 50 gm, the weight of the empty box is:

SSC CHSL 02/07/2024 (Shift-03)

(a) 214.05 kg. (b) 240 kg.
(c) 400 kg. (d) 416.40 kg.

299. A covered wooden box has the inner measures as 128 cm, 90 cm, 25 cm and the thickness of wood is 5.5 cm. Find the volume of the wood.

SSC CHSL 09/07/2024 (Shift-01)

(a) 329431 cm^3 (b) 217404 cm^3
(c) 819832 cm^3 (d) 192392 cm^3

300. To pack a set of books, Gautam got cartons of a certain height that were 48 inches long and 27 inches wide. If the volume of such a carton was 22.5 cubic feet, what was the height of each carton? [Use 1 foot = 12 inches.]

SSC CHSL 24/05/2022 (Shift-03)

(a) 36 Inches (b) 32.5 Inches
(c) 30 Inches (d) 32 Inches

301. How many 25 cm × 11.25 cm × 6 cm bricks will be required to construct a 8 m × 6 m × 22.5 cm wall? (ignoring other material used)

SSC CHSL 26/05/2022 (Shift-01)

(a) 7020 (b) 6400
(c) 5800 (d) 6800

302. The volume of a cube is four times the volume of a cuboid. If the sides of the cuboid are 32 cm, 8 cm and 4 cm, then find the ratio of the total surface area of the cube to that of the cuboid.

SSC CPO 27/06/2024 (Shift-02)

(a) 23 : 13 (b) 24 : 13
(c) 21 : 13 (d) 22 : 13

303. A closed wooden box measures externally 10 cm long, 8 cm broad and 6. cm high. If the thickness of the wood is 0.5 cm, then the volume of wood required is:

SSC MTS 14/09/2023 (Shift-03)

(a) 150 cm^3 (b) 165 cm^3
(c) 300 cm^3 (d) 230 cm^3

304. Which of the following two will provide more volume?

I. A cuboid of edges 6 cm, 7 cm and 8 cm
II. A cube of edge 7 cm

SSC CGL 02/12/2022 (Shift-01)

(a) Cube will have more volume
(b) Both will have equal volume
(c) Cuboid will have more volume
(d) Cannot be determined

305. The volume of a cuboid is twice that of a cube. If the dimensions of the cuboid are (8m × 8m ×16m), the total surface area of the cube is:

SSC CGL 21/07/2023 (Shift-01)

(a) 316 m^2 (b) 288 m^2
(c) 324 m^2 (d) 384 m^2

306. How many cubes of edge 15 cm can be put in a cubical box of 3 m edge ?

SSC CHSL 09/07/2024 (Shift-03)

(a) 9000 (b) 1050
(c) 8000 (d) 2000

307. A cuboid of dimensions 50 cm, 150 cm, 175 cm can be divided into how many identical largest cubes?

SSC CGL 11/09/2024 (Shift-03)

(a) 75 (b) 84
(c) 85 (d) 90

◆ TYPE – III ◆
CYLINDER

308. What is the curved surface area of cylinder whose radius is 3 cm and height is 14 cm? (Take $\pi = \frac{22}{7}$)

SSC CHSL 04/07/2024 (Shift-02)

(a) 262 cm^2 (b) 263 cm^2
(c) 261 cm^2 (d) 264 cm^2

309. The diameter of the base of a cylindrical tank is 28 cm and its height is 42 cm. Find its curved surface area.

SSC CHSL 05/07/2024 (Shift-02)

(a) 3680 cm^2 (b) 3690 cm^2
(c) 3696 cm^2 (d) 3686 cm^2

310. If the curved surface area of a cylinder is 880 cm^2, then the product of its height and radius is:

SSC CGL 13/09/2024 (Shift-03)

(a) 90 cm^2 (b) 120 cm^2
(c) 220 cm^2 (d) 140 cm^2

311. The curved surface area of a right circular cylinder of height 56cm is 1408 cm^2. Find the diameter of the base of the cylinder.

SSC CGL 27/07/2023 (Shift-03)

(a) 8 m (b) 0.04 m
(c) 0.08 m (d) 0.008 m

312. The height of a cylinder is 45 cm. If circumference of its base is 132 cm, then what is the curved surface of this cylinder? [Use $\pi = 22/7$]

SSC CGL TIER-II 08/08/2022

(a) 5720 cm^2 (b) 5940 cm^2
(c) 6270 cm^2 (d) 6360 cm^2

313. The curved surface area of a cylinder is five times the area of a base. Find the ratio of radius and height of the cylinder.

SSC CGL TIER-II 18/11/2020)

(a) 2 : 5 (b) 2 : 3
(c) 3 : 4 (d) 3 : 5

314. Two cylinders have the radii of their bases in the ratio 4 : 5 and their heights are in the ratio 5 : 7. Find the ratio of their curved surface areas.

SSC CGL 12/09/2024 (Shift-02)

(a) 5 : 4 (b) 4 : 7
(c) 1 : 2 (d) 4 : 5

315. A field roller, in the shape of a cylinder, has a diameter of 1 m and length of $1\frac{1}{4}$ m. If the speed at which the roller rolls is 14 revolutions per minute, then the maximum area (in m^2) it can roll in 1 hour is : [Take π = 22/7]

SSC CGL TIER-II 12/09/2019

(a) 3960 (b) 3600
(c) 3300 (d) 3560

316. The diameter of a roller is 35 cm and its length is 100 cm. It takes 200 complete revolutions to level a playground. Find the area of the playground in m^2

SSC CHSL 05/07/2024 (Shift-04)

(a) 1,10,000 (b) 110
(c) 2,20,00.000 (d) 220

317. The radius of a roller is 49 cm and its length is 200 cm. If takes 700 complete revolutions to move once over to level a playground. Find the area of the playground. (Use $\pi = \frac{22}{7}$)

SSC CHSL 01/07/2024 (Shift-03)

(a) 4312 × 10^3 cm^2
(b) 4312×10^2 cm^2
(c) 4322 × 10^4 cm^2
(d) 4312 × 10^4 cm^2

318. What will be the total cost (in ₹) of polishing the curved surface of a wooden cylinder at rate of ₹50 per m^2, if its diameter is 70cm and height is 6 m? [Take π = 22/7]

SSC CGL 13/04/2022 (Shift-02)

(a) 612 (b) 675
(c) 660 (d) 624

319. The diameter of a cylinder is 14 cm and its height is 9 cm. Find the total surface area of the cylinder.

SSC CHSL 04/07/2024 (Shift-03)

(a) 700 cm^2 (b) 708 cm^2
(c) 714 cm^2 (d) 704 cm^2

320. What is the total surface area of a cylinder having radius of base as 7 cm and height as 5 cm?

SSC CHSL 21/03/2023 (Shift-02)

(a) 426 cm² (b) 528 cm²
(c) 428 cm² (d) 572 cm²

321. If the radius and height of a right circular cylinder are 21 cm and 5 cm, respectively, then the total surface area of the cylinder is-
(use $\pi = 22/7$):

SSC CGL 26/09/2024 (Shift-02)

(a) 4312 cm² (b) 3432 cm²
(c) 5212 cm² (d) 3816 cm²

322. If the height of a solid right circular cylinder is 27 cm and diameter of its base is 30 cm, the total surface area (in cm²) of the right circular cylinder is: (Take $\pi = \frac{22}{7}$)

SSC CHSL 04/07/2024 (Shift-04)

(a) 3964 (b) 3960
(c) 3978 (d) 3976

323. If the diameter of the base and curved surface area of a cylinder are 14cm and 352 cm, respectively, then the total surface area of the cylinder is equal to:

SSC CHSL 04/07/2024 (Shift-01)

(a) 660 cm² (b) 760 cm²
(c) 754 cm² (d) 654 cm²

324. The curved surface area of a right circular cylinder of height 14 cm, is 88 cm². Find the total surface area of the cylinder.

SSC CHSL 03/07/2024 (Shift-02)

(a) $\frac{560}{7}$ cm² (b) $\frac{360}{7}$ cm²
(c) $\frac{660}{7}$ cm² (d) $\frac{460}{7}$ cm²

325. A cylinder of radius 7 cm has a curved surface area of 2200 cm². Find its total surface area. [Use $\pi = 22/7$]

SSC CPO 28/06/2024 (Shift-02)

(a) 2508 cm² (b) 2260 cm²
(c) 2550 cm² (d) 1580 cm²

326. A cylinder has a total surface area of 64π square units, where the height of the cylinder is equal to its radius. If the height is doubled and the radius is halved, then the total surface area of the new cylinder is ________ square units.

SSC MTS 08/09/2023 (Shift-03)

(a) 40π (b) 48π
(c) 64π (d) 54π

327. If the height and diameter of a cylinder are 12 cm and 28 cm, respectively, then find the ratio of the total surface area to the curved surface area.

SSC CGL 17/09/2024 (Shift-02)

(a) 13 : 5 (b) 10 : 3
(c) 13 : 6 (d) 11 : 6

328. The sum of the radius of the base and the height of a closed solid cylinder is 12.5 cm. If the total surface area of the cylinder is 275 cm², then its radius is: [Take $\pi = 22/7$]

SSC CHSL 12/04/2021 (Shift-03)

(a) 3.5 cm (b) 3 cm
(c) 7 cm (d) 5 cm

329. The sum of the radius of the base and the height of a cylinder is 42m. If the total surface area of the cylinder is 6336 m², find the curved surface area of the cylinder correct to two places of decimals . [Take $\pi = 22/7$]

SSC CHSL 02/08/2023 (Shift-04)

(a) 2157.43m² (b) 2571.43m²
(c) 2715.43m² (d) 2517.43m²

330. A closed cylindrical tank of radius 1.5 m and height 3 m is made from a sheet of metal, how much sheet of metal is required to do it?

SSC CHSL 09/07/2024 (Shift-02)

(a) 42.24 m² (b) 24.42 m²
(c) 42.42 m² (d) 24.24 m²

331. What will be the total cost (in ₹) of polishing the curved surface of a wooden cylinder at rate of ₹50 per m², if its diameter is 70cm and height is 6 m? [Take $\pi = 22/7$]

SSC CGL 13/04/2022 (Shift-02)

(a) 612 (b) 675
(c) 660 (d) 624

332. A solid cylinder having radius of base as 28 cm and height as 24 cm is bisected from its height to get two identical cylinders. What will be the percentage increase in the total surface area?

SSC MTS 17/05/2023 (Shift-01)

(a) 61.72% (b) 41.92%
(c) 53.85% (d) 48.64%

333. The ratio of the lateral surface area to the total surface area of a cylinder with base diameter 60cm and height 10cm is:

SSC CHSL 04/07/2024 (Shift-04)

(a) 1 : 9 (b) 1 : 7
(c) 1 : 4 (d) 1 : 3

334. A cylindrical oil tank has a radius of 5 m and a total surface area of 628 m², what would be its curved surface area? (round off to the second decimal place)

SSC CHSL 05/07/2024 (Shift-01)

(a) 371.83m² (b) 401.43m²
(c) 470.8m² (d) 481.43m²

335. Find the difference between the curved surface area and total surface area of a right circular cylinder having a length of 68 cm and base diameter of 28 cm.

SSC CHSL 02/07/2024 (Shift-03)

(a) 1432 cm² (b) 1132 cm²
(c) 1332 cm² (d) 1232 cm²

336. Find the capacity of an overhead cylindrical water tank, in litres, whose radius is 2.1 m and height is 6.3 m.

SSC CHSL 04/07/2024 (Shift-03)

(a) 87318 (b) 65622
(c) 61802 (d) 611726

337. What is the volume of a cylinder if the radius of the cylinder is 10 cm and height is 20 cm? (Take $\pi = 3.14$)

SSC CGL TIER-II 07/03/2023

(a) 6280 cm³ (b) 5306 cm³
(c) 6260 cm³ (d) 5280 cm³

338. What is the volume (in cm³) of a cylinder if the radius of the cylinder is 8 cm and the height is 14 cm? (Take $\pi = \frac{22}{7}$)

SSC CGL 09/09/2024 (Shift-02)

(a) 2686 (b) 2816
(c) 2784 (d) 2456

339. The height of a cylinder is 8 cm, and its area of the base is 20 cm². Find its volume?

SSC CPO 29/06/2024 (Shift-02)

(a) 180 cm³ (b) 80 cm³
(c) 160 cm³ (d) 100 cm³

340. The circumference of the base of a cylindrical vessel is 44 cm and its height is 25 cm. How many liters of water can it hold? (Take $\pi = \frac{22}{7}$)

SSC CGL 17/09/2024 (Shift-01)

(a) 38.5 (b) 3.58
(c) 3.85 (d) 83.5

341. A cylinder has a radius of $\frac{8}{\pi}$ cm and its volume is 448 cm³. What is the height of the cylinder (take $\pi = \frac{22}{7}$)?

SSC CHSL TIER-II (18/11/2024)

(a) 23 cm (b) 24 cm
(c) 21 cm (d) 22 cm

342. The volume of a right circular cylindrical box of radius 30cm is 600cm³. Find the height of the box.

SSC CGL 24/09/2024 (Shift-01)

(a) 0.61cm (b) 0.31cm
(c) 0.51cm (d) 0.21cm

343. The circumference of the base of the cylindrical vessel is 154 cm and its height is 49 mm. How many litres of water can it hold? (correct to three places of decimals, use $\pi = \frac{22}{7}$)

SSC CGL 25/09/2024 (Shift-01)

(a) 9.244 (b) 2.439
(c) 3.924 (d) 4.329

344. The capacity of a cylinder tank is 8316 cm³. If the radius of its base is 21 cm, then find the depth of the tank.

SSC CHSL 02/07/2024 (Shift-01)

(a) 4 cm (b) 6 cm
(c) 10 cm (d) 8 cm

345. Ranu carries water to school in a cylindrical flask with diameter 12 cm and height 21 cm. Determine the amount of water that she can carry in the flask. [Take $\pi = 22/7$]

SSC CGL 14/07/2023 (Shift-04)

(a) 2372 cm³ (b) 2370 cm³
(c) 2376 cm³ (d) 2374 cm³

346. What is the volume in cubic units of a cylinder with a height equal to the diameter and a radius is 4 units?

SSC CGL 13/09/2024 (Shift-02)

(a) 128π (b) $\frac{64\pi}{3}$
(c) 32π (d) $\frac{32\pi}{3}$

347. The volume of a cylinder is $1650 m^3$, whereas the surface area of its base is $78\frac{4}{7} m^2$. Find the height of the cylinder.

SSC Phase-XI 30/06/2023 (Shift-01)

(a) 75 m (b) 14 m
(c) 21 m (d) 24 m

348. The radius of a right circular cylinder is five times of its height. If the height of the cylinder is 3.5 cm, then what is the volume of cylinder?

SSC CGL 02/12/2022 (Shift-03)

(a) $3368.75 cm^3$ (b) $3872.75 cm^3$
(c) $3146.75 cm^3$ (d) $3524.25 cm^3$

349. The radius of a right circular cylinder is four times of its height. If the height of the cylinder is 14 cm, then what is the volume of cylinder?

SSC CGL 12/12/2022 (Shift-02)

(a) $15468 cm^3$ (b) $14262 cm^3$
(c) $137984 cm^3$ (d) $11296 cm^3$

350. The height of a solid cylinder is 35 cm. The circumference of its base is 37 cm more than the radius. What will be the volume of this cylinder?

SSC CGL TIER-II 08/08/2022

(a) $4420 cm^3$ (b) $4850 cm^3$
(c) $4740 cm^3$ (d) $5390 cm^3$

351. The volume of a solid cylinder is $2002 cm^3$ and its height is 13 cm. What is the area (in cm^2) of its base? [Take $\pi = 22/7$]

SSC CGL TIER-II 29/01/2022

(a) 154 (b) 77
(c) 308 (d) 231

352. The curved surface area and the volume of a cylindrical object are $88 cm^2$ and $132 cm^3$, respectively. The height (in cm) of the cylindrical object is: [Take $\pi = 22/7$]

SSC CGL TIER-II 29/01/2022

(a) $3\frac{2}{3}$ (b) 4
(c) 6 (d) $4\frac{2}{3}$

353. The curved surface area of a cylinder, whose height is 10 cm, is $1320 cm^2$. What is the volume of this cylinder? [Take $\pi = 22/7$]

SSC MTS 20/07/2022 (Shift-02)

(a) $1388 m^3$ (b) $0.001368 m^3$
(c) $0.01386 m^3$ (d) $0.1386 m^3$

354. A pillar of 11 meter radius is 21 m high. How much material was used to construct it? [Take $\pi = 22/7$]

SSC CHSL 24/05/2022 (Shift-01)

(a) $7996 m^3$ (b) $7886 m^3$
(c) $7989 m^3$ (d) $7986 m^3$

355. A cylinder has a radius of 7 cm and the area of its curved surface is $396 cm^2$. The volume of the cylinder is:

SSC CPO 28/06/2024 (Shift-02)

(a) $1396 cm^3$ (b) $1381 cm^3$
(c) $1386 cm^3$ (d) $1391 cm^3$

356. The circumference of the base of a right circular cylinder is 62.8 cm and its volume is $8792 cm^3$. What is the curved surface area (in cm^2) of the cylinder? [Take it $\pi = 3.14$]

SSC CGL 18/04/2022 (Shift-02)

(a) 1570.2 (b) 1695.6
(c) 1632.8 (d) 1758.4

357. The height of a cylinder is 20 cm. The lateral surface area is $1760 cm^2$. Its volume is:

SSC CGL 12/09/2024 (Shift-01)

(a) $12032 cm^3$ (b) $12302 cm^3$
(c) $12203 cm^3$ (d) $12320 cm^3$

358. The curved surface area of a solid cylinder of height 15 cm is $660 cm^2$. What is the volume (in cm^3) of the cylinder? [Take $\pi = 22/7$]

SSC CPO 05/10/2023 (Shift-02)

(a) $2060 cm^3$ (b) $3210 cm^3$
(c) $2540 cm^3$ (d) $2310 cm^3$

359. The sum of the curved surface area and total surface area of a solid cylinder is $2068 cm^2$. If radius of its base is 7 cm, then what is the volume of this cylinder? [Take $\pi = 22/7$]

SSC CGL TIER-II (08/08/2022)

(a) $2480 cm^3$ (b) $2760 cm^3$
(c) $3080 cm^3$ (d) $2060 cm^3$

360. The base radius of a circular cylinder is 10.5 cm. If the area of its curved surface is $792 cm^2$, then what is the volume of the cylinder?

SSC CGL 19/09/2024 (Shift-02)

(a) $4185 cm^3$ (b) $4518 cm^3$
(c) $4152 cm^3$ (d) $4158 cm^3$

361. A cylindrical tank of radius 14 cm is full of water. If 616 litres of water are drawn out, then the water level in the tank is dropped by ------- m. (Take $\pi = 22/7$)

(a) 1000 (b) 100
(c) 1 (d) 10

362. A cylinder has a curved surface area equal to 350% of the curved surface area of another cylinder. If their radii are in the ratio 3 : 1, then the volume of the smaller cylinder is approximately _____% of the larger cylinder (the smaller cylinder has its radius and height smaller when compared to the larger).

SSC CHSL 09/07/2024 (Shift-01)

(a) 9.52 (b) 8.86
(c) 7.28 (d) 10.16

363. A patient in a hospital is given tea daily in a cylindrical cup of diameter 7 cm. If the cup is filled with tea to a height of 4 cm, how much tea the hospital has to prepare daily to serve 180 patients? [Use $\pi = 22/7$]

SSC CHSL 10/07/2024 (Shift-01)

(a) 22.27 litres (b) 22.77 litres
(c) 27.27 litres (d) 27.72 litres

364. The cost of painting the total surface area of a 30 m high solid right circular cylinder at the rate of 25 per m^2 is ₹18,425. What is the volume (in m^3) of this cylinder [Take $\pi = 22/7$] ?

SSC CPO 03/10/2023 (Shift-02)

(a) 1210 (b) 1155
(c) 1145 (d) 1122

365. Water is flowing through a cylindrical canal with an internal diameter of 7 m at the speed of 18 km/h. Find the volume of water flowing through the canal in 30 minutes. [Take $\pi = 22/7$]

SSC CPO 09/11/2022 (Shift-0

(a) $3,76,500 m^3$ (b) $3,56,500 m^3$
(c) $3,66,500 m^3$ (d) $3,46,500 m^3$

366. A river 6m deep and 35m wide is flowing at the rate of 2.5 km/h, the amount of water that runs into the sea per minute is:

SSC CGL 18/04/2022 (Shift-0

(a) $7580m^3$ (b) $8570m^3$
(c) $7850m^3$ (d) $8750m^3$

367. The radii of two cylinders are in the ratio 2 : 1 and their heights are in the ratio 5 : 2. What will be the ratio of their volumes?

SSC CHSL TIER-II 26/06/202

(a) 20 : 1 (b) 10 : 1
(c) 5 : 1 (d) 15 : 1

368. The ratio of the volume of two cylinders is 13 : 1 and the ratio of their heights is 13 : 9. If the area of the base of the second cylinder is $154 cm^2$, then what will be the radius of the first cylinder?

SSC MTS 13/06/2023 (Shift-0

(a) 42 cm (b) 21 cm
(c) 28 cm (d) 14 cm

369. If the ratio of the volumes of two cylinders is 6 : 1 and the ratio of their heights is 1 : 6, then what is the ratio of their radii ?

SSC CHSL 10/03/2023 (Shift-0

(a) 9 : 1 (b) 3 : 1
(c) 8 : 1 (d) 6 : 1

370. The ratio of the volume of first and second cylinder is 32 : 9 and the ratio of their heights is 8 : 9. If The area of the base of the second cylinder is $616 cm^2$, then what will be the radius of the first cylinder?

SSC CHSL 14/03/2023 (Shift-0

(a) 24 cm (b) 20 cm
(c) 28 cm (d) 36 cm

371. The radius of the base of a cylindrical tank is 4 m. If three times the sum of the area of its two circular faces is twice the area of its curved surface, then the capacity (in kiloliters) of the tank is:

SSC CGL TIER-II 29/01/20

(a) 108π (b) 54π
(c) 144π (d) 96π

372. The volume of a cylinder is $4312 cm^3$. Its curved surface area is one-third of its total surface area. Its curved surface area (in cm^2) is:
[Take $\pi = 22/7$]

SSC CGL TIER-II 03/02/20

(a) 572 (b) 660
(c) 660 (d) 616

373. The curved surface area of a cylinder is 462 cm^2 and its base area is 346.5 cm^2. What is the volume (in cm^3) of the cylinder? [Take $\pi = 22/7$]

SSC CGL 17/08/2021 (Shift-01)

(a) 4800 (b) 2425.5
(c) 4850 (d) 2400

374. Let A and B be two cylinders such that the capacity of A is the same as the capacity of B. The ratio of the diameters of A and B is 1 : 4. What is the ratio of the heights of A and B?

SSC CPO 25/11/2020 (Shift-02)

(a) 3 : 16 (b) 1 : 16
(c) 16 : 1 (d) 16 : 3

375. If the numerical value of twice the curved surface area of a right circular cylinder is equal to the numerical value of its volume, then what is the numerical value of the radius of the base of the cylinder?

SSC CGL 13/12/2022 (Shift-01)

(a) 2 (b) 3
(c) 5 (d) 4

376. A goldsmith uses 110 cm^3 of gold to make a wire 1 mm in diameter. He will use this wire to make gold chains of equal lengths. If each chain requires 56 cm length of wire, then how many gold chains can he make? [Take $\pi = 22/7$]

SSC MTS 07/07/2022 (Shift-01)

(a) 320 (b) 250
(c) 160 (d) 210

377. The respective ratio between numerical values of the curved surface area and the volume of a right circular cylinder is 2 : 3. If the respective ratio between the radius and the height of the cylinder is 3 : 7, what is the total surface area of the cylinder ?

SSC CHSL 01/07/2024 (Shift-02)

(a) 62 π $unit^2$ (b) 60 π $unit^2$
(c) 45 π $unit^2$ (d) 65 π $unit^2$

378. The ratio between the height and radius of the base of a cylinder is 7 : 5. If its volume is 14836.5 cm^3, then find its total surface area.

(Take $\pi = 3.14$)

SSC CPO 09/11/2022 (Shift-01)

(a) 3391.2 cm^2 (b) 5391.2 cm^2
(c) 4391.2 cm^2 (d) 5591.2 cm^2

379. The radius and height of a cylinder are in the ratio 6 : 7 and its volume is 792 cm^3. Calculate its curved surface area in cm^2.

SSC CHSL 02/07/2024 (Shift-04)

(a) 226 (b) 264
(c) 262 (d) 490

380. Two similar jugs have their heights of 8cm and 12cm respectively. If the capacity of the smaller jug is 80cm^3, what is the capacity of the bigger jug (in cm^3)?

SSC CGL 19/04/2022 (Shift-02)

(a) 216 (b) 120
(c) 270 (d) 192

◆ TYPE – IV ◆
HOLLOW CYLINDER

381. The external diameter of an iron pipe is 20 cm and its length is 12 cm. If the thickness of the pipe is 1 cm, find the surface area of the pipe correct to two places of decimal. [Take $\pi = 22/7$]

SSC CGL 06/12/2022 (Shift-02)

(a) 1,662.67 cm^2 (b) 1,552.57 cm^2
(c) 1,442.48 cm^2 (d) 1,772.76 cm^2

382. A hollow cylindrical tube made of plastic is 3 cm thick. If the external diameter is 20 cm and length of the tube is 49 cm, find the volume of the plastic.

SSC CPO 05/10/2023 (Shift-03)

(a) 7644 cm^3 (b) 7238 cm^3
(c) 7854 cm^3 (d) 7546 cm^3

383. A drainage tile is a cylindrical shell 42 cm long. The inside and outside diameters are 8 cm and 14 cm, respectively. What is the volume (in cm^3) of clay required for the tile? [Use $\pi = 22/7$]

SSC CPO 27/06/2024 (Shift-03)

(a) 5241 (b) 4356
(c) 4881 (d) 4125

384. A one meter pipe is made with inner diameter equal to outer radius. How much material (in cubic units) is required to make the pipe, if it can hold $\frac{88}{7}$ cubic meters water in it?

SSC CGL 24/07/2023 (Shift-01)

(a) 37.7 $unit^3$ (b) 35.5 $unit^3$
(c) 33.3 $unit^3$ (d) 36.6 $unit^3$

385. A cylindrical tube, open at both ends, is made of a metal sheet which is 0.5 cm thick. Its outer radius is 4 cm and length is 2 m. How much metal (in cm^3) has been used in making the tube?

SSC CGL TIER-II 03/02/2022

(a) 800 π (b) 450 π
(c) 750 π (d) 550 π

◆ TYPE – V ◆
CONE

386. Find the curved surface area (in cm^2) of a cone of radius 3 cm and height 4 cm.

SSC CPO 29/06/2024 (Shift-01)

(a) 12π (b) 7π
(c) 15π (d) 14π

387. Find the curved surface area of a cone whose base radius is 7 cm and slant height is 10 cm is:

SSC CPO 03/10/2023 (Shift-02)

(a) 280 cm^2 (b) 300 cm^2
(c) 220 cm^2 (d) 250 cm^2

388. The circumference of the base of a conical tent of height 8 m is 32 π m. Find its curved surface area.

SSC CGL 12/09/2024 (Shift-03)

(a) $164\sqrt{5}\pi m^2$ (b) $162\sqrt{3}\pi m^2$
(c) $132\sqrt{3}\pi m^2$ (d) $128\sqrt{5}\pi m^2$

389. The radius of the base of a right circular cone is 9 cm and its slant height is 49 cm. Find the curved surface area of the cone.

SSC CGL 18/09/2024 (Shift-02)

(a) 1386 cm^2 (b) 1265 cm^2
(c) 1262 cm^2 (d) 1490 cm^2

390. The curved surface area of a cone is 2200 cm^2 and its radius is 28 cm, what is the slant height (in cm) of the cone? [Use $\pi = 22/7$]

SSC CHSL 01/07/2024 (Shift-03)

(a) 22 (b) 24
(c) 23 (d) 25

391. The curved surface area of a cone is 308 cm^2, and its slant height is 28 cm. Find the radius of its base.

[Use $\pi = 22/7$]

SSC CPO 28/06/2024 (Shift-03)

(a) 2.8 cm (b) 3.5 cm
(c) 2.5 cm (d) 3.0 cm

392. The area of the canvas cloth needed to erect a right conical tent of height 20ft. and circular base of circumference 30π ft. is:

SSC CPO 28/06/2024 (Shift-03)

(a) 455π sq.ft. (b) 375π sq.ft.
(c) 589π sq.ft. (d) 470π sq.ft.

393. A cone of slant height 4.2 units has a lateral surface area 13.2 $units^2$. The radius of the base is:

SSC CPO 29/06/2024 (Shift-01)

(a) 1 unit (b) 1.5 units
(c) 2.5 units (d) 2 units

394. The ratio of the slant height and the height of a cone is 4: 3. If the curved surface area of the cone is $4\sqrt{7}\pi$ square units, then the radius of the cone is ___ units.

SSC CPO 29/06/2024 (Shift-03)

(a) $7\sqrt{7}$ (b) 7
(c) $\sqrt{7}$ (d) $\frac{\sqrt{7}}{7}$

395. The radius of a cone is 10.5 cm and the area of the curved surface is 396 cm^2. Find its slant height.

[Take $\pi = 22/7$]

SSC MTS 08/09/2023 (Shift-01)

(a) 8.5 cm (b) 11.5 cm
(c) 9 cm (d) 12 cm

396. The curved surface area of a right circular cone having diameter 42 cm is 990 cm^2. What is the slant height (in cm) of the cone? [Take $\pi = 22/7$]

SSC CHSL 14/08/2023 (Shift-03)

(a) 10 (b) 15
(c) 24 (d) 12

397. A conical tent of height 10m and base diameter 48m was erected by a company in a park. Find the curved surface area of the tent (in m^2).

SSC CGL 18/07/2023 (Shift-01)

(a) 576π (b) 1248π
(c) 1152π (d) 624π

398. A conical tent with radius 6 units and height 8 units is to be made by canvas. How much canvas is needed to make the tent? (Rounded off to two places of decimals)

SSC CGL 18/07/2023 (Shift-03)

(a) 188.57 units (b) 155.87 units
(c) 166.57 units (d) 177.55 units

399. A heap of wheat is in the form of a cone whose base diameter is 8.4 m and height is 1.75 m. The heap is to be covered by canvass. What is the area (in m^2) of the canvas required? [Use $\pi = 22/7$]

SSC CGL 16/08/2021 (Shift-02)

(a) 60.06 (b) 115.05
(c) 60.6 (d) 115.5

400. How many meters of cloth will be required to make a conical tent, the radius of whose base is 21 meters and height is 28 meters. The width of the cloth is 5 meters. (Where $\pi = 22/7$)

SSC CPO 27/06/2024 (Shift-01)

(a) 470 (b) 462
(c) 456 (d) 478

401. A solid cone with curved surface area twice its base area has slant height of $6\sqrt{3}$ cm. Its height is:

SSC CGL 20/07/2023 (Shift-02)

(a) $6\sqrt{2}$ cm (b) 9 cm
(c) 6 cm (d) $3\sqrt{6}$ cm

402. The radius of the base of a conical tent is 8 m and its height is 15 m, what is the cost of the material needed to make it if it costs Rs.54π per m^2?

SSC MTS 08/05/2023 (Shift-02)

(a) ₹6454 (b) ₹7344
(c) ₹8678 (d) ₹7454

403. The circumference of base of a right circular cone is 88 cm. If the height of the cone is 28 cm, then what is the curved surface area of the cone?

SSC CHSL 09/03/2023 (Shift-02)

(a) $670\sqrt{3}$ m^2 (b) $616\sqrt{5}$ m^2
(c) $627\sqrt{3}$ m^2 (d) $561\sqrt{5}$ m^2

404. The curved surface area of a right circular cone of base radius 21 cm is 594 sq. cm. What is the slant height of the cone?

SSC CGL 09/12/2022 (Shift-03)

(a) 15 cm (b) 11 cm
(c) 9 cm (d) 6 cm

405. The slant height and the radius of a right circular cone are 11 cm and 6 cm, respectively. What is the curved surface area of the cone?

SSC MTS 12/07/2022 (Shift-02)

(a) 74π cm^2 (b) 60π cm^2
(c) 44π cm^2 (d) 66π cm^2

406. The slant height of a cone is 20 cm. If area of its base is 616 cm^2, then what is the curved surface area of this cone? [Use $\pi = 22/7$]

SSC CGL TIER-II (08/08/2022)

(a) 880 cm^2 (b) 960 cm^2
(c) 440 cm^2 (d) 1760 cm^2

407. A conical shape vessel has a radius of 21 cm and has a slant height of 25 cm. If the curved part of the vessel is to be painted white, find the cost (in ₹) of painting at the rate of ₹ 1.5 per cm^2.

SSC CPO 03/10/2023 (Shift-02)

(a) 2475 (b) 825
(c) 1680 (d) 1250

408. What is the total surface area of a cone whose curved surface area is 550 cm^2 and radius is 7 cm?

(Take $\pi = \frac{22}{7}$)

SSC CGL 26/09/2024 (Shift-01)

(a) 764.71 cm^2 (b) 704.00 cm^2
(c) 682.60 cm^2 (d) 714.05 cm^2

409. What is the total surface area of a cone whose radius is $\frac{r}{4}$ and slant height is $4l$?

SSC CPO 27/06/2024 (Shift-01)

(a) $8\pi r(l + r)$ (b) $\pi r\left(l + \frac{r}{16}\right)$
(c) $\pi r\left(l + \frac{r}{4}\right)$ (d) $4\pi r(l + r)$

410. Find the volume of a cone having base radius 3.5 cm and height 18 cm.

SSC CGL 26/09/2024 (Shift-03)

(a) 241 cm^3 (b) 221 cm^3
(c) 201 cm^3 (d) 231 cm^3

411. If the height of a cone is 7 cm and the diameter of the circular base is 12 cm, then its volume is (nearest to integer):

SSC CPO 03/10/2023 (Shift-01)

(a) 264 cm^3 (b) 284 cm^3
(c) 274 cm^3 (d) 254 cm^3

412. What is the volume of a cone (in cubic units) with radius 3 units and slant height $3\sqrt{2}$ units?

SSC CGL 18/09/2024 (Shift-03)

(a) 18π (b) $\frac{10\pi}{3}$
(c) $\frac{9\pi}{2}$ (d) 9π

413. What is the height (in m) of a conical water tank having radius of 70 m and volume of 46,200 m^3?

$\left(\text{Take } \pi = \frac{22}{7}\right)$

SSC CGL 13/09/2024 (Shift-01)

(a) 27 (b) 9
(c) 18 (d) 54

414. If the height of a right circular cone is 24 cm and radius of its base is 10.5 cm, then the volume of right circular cone (in cm^3) is:

Take $\pi = \frac{22}{7}$

SSC CHSL 03/07/2024 (Shift-03)

(a) 2237 (b) 2277
(c) 2772 (d) 2727

415. If the radius of the base and slant height of the cone is 6 cm and 10 cm, respectively, then the volume of the cone is equal to:

SSC CHSL 09/07/2024 (Shift-03)

(a) 108π cm^3 (b) 96π cm^3
(c) 98π cm^3 (d) 106π cm^3

416. The volume of a right circular cone is 150π cm^3 and its height is 18 cm. Find its slant height (in cm) (correct to 2 decimal places).

SSC CPO 28/06/2024 (Shift-03)

(a) 18.68 (b) 25.35
(c) 28.68 (d) 15.25

417. The height and radius of a cone-shaped storage tank are 9 ft. and 7ft., respectively. Find the volume of water the tank can hold?

[Use $\pi = 22/7$]

SSC CPO 29/06/2024 (Shift-01)

(a) 462 cubic fit. (b) 527 cubic fit.
(c) 1386 cubic fit. (d) 1423 cubic fit.

418. The curved surface area of a right circular cone is 20π cm^2. If its radius is 4 cm, then find the volume of cone

SSC CHSL 10/07/2024 (Shift-02)

(a) 18π cm^3 (b) 21π cm^3
(c) 20π cm^3 (d) 16π cm^3

419. Volume of a cone whose radius of base and height are r and h respectively, is 400 cm^3. What will be the volume of a cone whose radius of base and height are 2r cm and h cm respectively?

SSC CGL TIER-II 08/08/2022

(a) 100 cm^3 (b) 1200 cm^3
(c) 1600 cm^3 (d) 800 cm^3

420. The volume of a right circular cone having a base diameter of 14 cm is 196π cm^3. Find the perpendicular height of this cone

SSC CPO 03/10/2023 (Shift-02)

(a) 8 cm (b) 14 cm
(c) 10 cm (d) 12 cm

421. The radius of the base of a right circular cone is 5 cm. Its slant height is 13 cm. What is its volume (in cm^3, rounded off to 1 decimal place)? [Take $\pi = 22/7$]

SSC CPO 04/10/2023 (Shift-01)

(a) 314.3 (b) 323.4
(c) 328.6 (d) 340.5

422. The height and the radius of the base of a right circular cone are in the ratio of 12: 5. If its volume is 314 cm^3, then what is the slant height of the cone? (Use $\pi = 3.14$)

SSC CPO 05/10/2023 (Shift-01)

(a) 11 cm (b) 14 cm
(c) 12 cm (d) 13 cm

423. A conical tent is set to accommodate 15 persons. Each person must have 5 square meters of space on the ground and 30 cubic meters of air to breathe. What is the height of the cone?

SSC MTS 12/09/2023 (Shift-02)

(a) 18 m (b) 22 m
(c) 13 m (d) 15 m

424. If the diameter of the base of a cone is 70 cm and its curved surface area is 4070 cm^2, then what will be its volume (in cm^3)? [Take $\pi = 22/7$]

SSC MTS 13/09/2023 (Shift-01)

(a) 1180 (b) 16,300
(c) 15,400 (d) 17,600

425. If a right circular cone of height 24 cm has the circumference of its base 42π cm, then the volume of the cone is [Take $\pi = 22/7$].

SSC CHSL 02/08/2023 (Shift-01)

(a) 15211cm^3 (b) 11088cm^3
(c) 12034 cm^3 (d) 21011 cm^3

426. The volume of a cone with height equal to radius, and slant height 5 cm is :

SSC CGL 17/07/2023 (Shift-01)

(a) $\frac{125\pi}{12\sqrt{3}} \text{cm}^3$ (b) $\frac{125\pi}{6\sqrt{3}} \text{cm}^3$
(c) $\frac{125\pi}{12\sqrt{2}} \text{cm}^3$ (d) $\frac{125\pi}{6\sqrt{2}} \text{cm}^3$

427. A conical vessel (solid) is made of iron. Its base radius is 7 cm and height is 15 cm. If the weight of the iron per cubic centimeter is 15 g, what is the weight of the vessel?

SSC CGL 09/12/2022 (Shift-02)

(a) 13.55 kg (b) 12.55 kg
(c) 14.55 kg (d) 11.55 kg

428. A conical vessel has radius 4 cm and its curved surface area is $20\pi \text{ cm}^2$. The volume of conical vessel is:

SSC Phase-X 02/08/2022 (Shift-02)

(a) $18\pi \text{ cm}^3$ (b) $16\pi \text{ cm}^3$
(c) $26\pi \text{ cm}^3$ (d) $12\pi \text{ cm}^3$

429. The heights of two right circular cones are in the ratio 1 : 5 and the perimeter of their bases are in the ratio 5 : 3. Find the ratio of their volumes.

SSC CPO 10/11/2022 (Shift-03)

(a) 8 :11 (b) 7 : 6
(c) 5 : 9 (d) 3 : 4

430. The radii of the two cones are in the ratio of 2 : 5 and their volumes are in the ratio of 3 : 5. What is the ratio of their heights?

SSC CGL 09/09/2024 (Shift-01)

(a) 15 : 4 (b) 11 : 15
(c) 13 : 11 (d) 4 : 11

431. If the radius of the right circular cone is increased by 20% and its height is decreased by 25%, then the volume of the right circular cone will be increased by:

SSC Phase-XII 26/06/2024 (Shift-04)

(a) 12% (b) 10%
(c) 8% (d) 15%

432. If the ratio of the volumes of two cones is 11:16 and the ratio of the radii of their bases is 3:4, then the ratio of their heights will be:

SSC CHSL 26/05/2022 (Shift-02)

(a) 11 : 9 (b) 4 : 11
(c) 3 : 16 (d) 9 : 11

433. The slant height and radius of a right circular cone are in the ratio 29:20. If its volume is $4838.4\pi \text{ cm}^3$, then its radius is:

SSC CGL TIER-II 29/01/2022

(a) 20 cm (b) 24 cm
(c) 25 cm (d) 28 cm

434. If the diameter of the base of a cone is 56 cm and its curved surface area is 3080 cm^2, then what will be its volume (in cm^3)? (Use $\pi = 22/7$)

SSC CGL TIER-II (20/01/2025)

(a) 17248 (b) 15391
(c) 14670 (d) 12250

435. Find the volume (in cm^3, rounded off to 2 decimal places) of a right circular cone of diameter 12 cm and height 5 cm. [Use $\pi = \frac{22}{7}$]

SSC CGL TIER-II (18/01/2025)

(a) 188.57 (b) 197.25
(c) 147.23 (d) 156.39

436. The height of a right circular cone is 63 cm and the area of its curved surface is five times the area of its base. What is the volume (in cm^3) of the cone? (Use $\pi = \frac{22}{7}$)

SSC CGL TIER-II (18/01/2025)

(a) 12589.10 (b) 13540.25
(c) 11234.65 (d) 10914.75

437. A toy is in the form of a cone mounted on a hemisphere. The radius of the hemisphere and that of the cone is 36 cm and height of the cone is 105 cm. The total surface area (in cm^2) of the toy is:

SSC CGL TIER-II (18/01/2025)

(a) 5240π (b) 6588π
(c) 6025π (d) 5799π

◆ TYPE – VI ◆
FRUSTUM

438. A 22.5 m high tent is in the shape of a frustum of a cone surmounted by a hemisphere. If the diameters of the upper and the lower circular ends of the frustum are 21 m and 39m, respectively, then find the area of the cloth (in m^2) used to make the tent (ignoring the wastage). [Take $\pi = 22/7$]

SSC CGL 21/04/2022 (Shift-03)

(a) $787\frac{2}{7}$ (b) $2800\frac{2}{7}$
(c) $1635\frac{6}{7}$ (d) $2107\frac{2}{7}$

439. The radii of the ends of a frustum of a cone 7 cm height are 5 cm and 3 cm. Find its volume correct to one decimal place. [Take $\pi = 22/7$]

SSC CGL 12/12/2022 (Shift-02)

(a) 345.6 cm^3 (b) 359.3 cm^3
(c) 379.3 cm^3 (d) 369.3 cm^3

◆ TYPE – VII ◆
SPHERE

440. Find the surface area (in cm^2) of a sphere of diameter 28 cm.
[Use $\pi = 22/7$]

SSC CPO 27/06/2024 (Shift-03)

(a) 1731 (b) 2464
(c) 2856 (d) 1724

441. The surface area (in cm^2) of a sphere, whose diameter is 42 cm, is:
[Take $\pi = 22/7$]

SSC Phase-XII 24/06/2024 (Shift-03)

(a) 5452 (b) 5524
(c) 5544 (d) 5430

442. Find the surface area of a ball of radius 21 mm. [Use $\pi = 22/7$]

SSC Phase-XII 21/06/2024 (Shift-02)

(a) 5544 mm^2 (b) 5540 mm^2
(c) 5546 mm^2 (d) 5542 mm^2

443. If the surface area of the sphere is 616 cm^2, then the radius of the sphere is equal to:

SSC CHSL 10/07/2024 (Shift-04)

(a) 14.0 cm (b) 3.5 cm
(c) 7.0 cm (d) 18.0 cm

444. If the radius of a sphere is increased by 40%, then find the percentage increase in its surface area.

SSC CPO 27/06/2024 (Shift-03)

(a) 96% (b) 85%
(c) 92% (d) 88%

445. If the radius of a sphere is increased by 125%, then by what percentage will its surface area increase (correct to two decimal places)?

SSC CPO 28/06/2024 (Shift-02)

(a) 506.25% (b) 509.54%
(c) 409.76% (d) 406.25%

446. If the radius of a sphere is increased by 3.5 cm, its surface area increases by 550 cm^2. What was the original radius of the sphere? ($\pi = \frac{22}{7}$)

SSC CHSL 08/07/2024 (Shift-02)

(a) 4.5 cm (b) 3.5 cm
(c) 4 cm (d) 6 cm

447. Rajesh is playing with football having diameter of 28 cm. He wants to get a photo of his favourite player painted on the entire ball. The painter charges ₹2/cm^2. What will be the cost (in ₹) of painting the ball (take $\pi = \frac{22}{7}$)?

SSC CHSL 05/07/2024 (Shift-01)

(a) 4,928 (b) 4,828
(c) 2,414 (d) 2,464

448. The outer surface of a sphere having diameter 10 m is painted at the rate of Rs. $\frac{80}{\pi}$ per m^2. What is the cost of painting?

SSC CHSL 02/07/2024 (Shift-04)

(a) Rs.4,000 (b) Rs.6,000
(c) Rs.8,000 (d) Rs.9,000

449. Find the cost of painting a ball that is in the shape of a sphere with a radius of 14 cm. The painting cost of the ball is Rs.5 per square centimetre (take $\pi = \frac{22}{7}$)

SSC CHSL 08/07/2024 (Shift-04)

(a) Rs.12,320 (b) Rs.13,220
(c) Rs.13,022 (d) Rs.12,230

450. The cost of painting a spherical vessel of diameter 14 cm is ₹21,560. What is the cost of painting (in ₹) per square centimeter?
[Use $\pi = 22/7$]
SSC CPO 28/06/2024 (Shift-01)
(a) 30 (b) 32
(c) 28 (d) 35

451. Aman wants to get his spherical overhead water tank having a diameter of 7 m, painted. If the cost of painting is ₹13 per square meter. Find the cost of painting Aman's spherical overhead water tank. [Take $\pi = 22/7$]
SSC CHSL 02/08/2023 (Shift-02)
(a) ₹1,872 (b) ₹1,984
(c) ₹2,002 (d) ₹1,926

452. A spherical ball of diameter 8 cm is cut into two equal parts. The curved area of one such part has to be painted with green color, while the other part has to be painted with red color. The bases of both the hemispheres are to be painted with blue color. The cost of painting with blue is ₹2/cm², while the cost of painting the curved area is ₹3/cm². What will be the cost (in ₹) of painting the hemispheres? (Take $\pi = 3.14$)
SSC PHASE-XI 27/06/2023 (Shift-04)
(a) ₹451.92 (b) ₹492.92
(c) ₹803.84 (d) ₹401.92

453. If the radius of a sphere is 2.1 cm, then the volume of sphere is equal to:
SSC CPO 27/06/2024 (Shift-01)
(a) 36.088 cm³ (b) 36.808 cm³
(c) 38.808 cm³ (d) 38.088 cm³

454. What is the radius of a sphere having a volume of 38808 cm³?
[Use $\pi = 22/7$]
SSC Phase-XII 25/06/2024 (Shift-03)
(a) 27 cm (b) 21 cm
(c) 24 cm (d) 18 cm

455. If the volume of a sphere is 972πcm³, then find its radius.
SSC CHSL 24/05/2022 (Shift-01)
(a) 7cm (b) 6cm
(c) 9cm (d) 8cm

456. Find the diameter of a spherical ball whose volume is 38.808 cm³.
$\left(\text{Use } \pi = \frac{22}{7}\right)$
SSC CHSL 01/07/2024 (Shift-04)
(a) 4.2 cm (b) 4.8 cm
(c) 4.6 cm (d) 4.4 cm

457. The surface area of a sphere is 2464 cm². Find its volume.
SSC CHSL 01/07/2024 (Shift-04)
(a) $13121\frac{1}{3}$ cm³ (b) $11892\frac{2}{3}$ cm³
(c) $11498\frac{2}{3}$ cm³ (d) $11621\frac{1}{3}$ cm³

458. If the diameter of a sphere is reduced to its half, then the volume would be:
SSC CPO 04/10/2023 (Shift-02)
(a) reduced by $\frac{1}{8}$ of the former volume
(b) increased by $\frac{1}{4}$ of the former volume
(c) reduced by $\frac{1}{4}$ of the former volume
(d) increased by $\frac{1}{8}$ of the former volume

459. The radii of two spheres are in the ratio 4 : 5. What will be the ratio of their volumes.
SSC CHSL TIER-II (18/11/2024)
(a) 16 : 25 (b) 4 : 5
(c) 64 : 125 (d) 125 : 64

460. The surface areas of two spheres are in the ratio 25 : 36. What is the ratio of their volumes?
SSC CHSL 01/07/2024 (Shift-02)
(a) $\frac{36}{125}$ (b) $\frac{25}{36}$
(c) $\frac{36}{115}$ (d) $\frac{125}{216}$

461. If the surface areas of two spheres are in the ratio of 49 : 81, then find the ratio of their volumes.
SSC CHSL 10/07/2024 (Shift-04)
(a) 125 : 512 (b) 343 : 729
(c) 27 : 64 (d) 216 : 512

462. The surface area of spherical ball is 1386 cm². What will be its volume?
SSC CHSL 11/07/2024 (Shift-03)
(a) 4825 cm³ (b) 5000 cm³
(c) 4851 cm³ (d) 4800 cm³

463. If the surface areas of two spheres are in the ratio of 9 : 49, then the ratio of their volumes is: [Use $\pi = 22/7$]
SSC CPO 27/06/2024 (Shift-03)
(a) 25 : 512 (b) 49 : 363
(c) 16 : 216 (d) 27 : 343

464. The surface area of a sphere is 2464 cm². Calculate its volume.
[Use $\pi = 22/7$]
SSC Phase-XII 26/06/2024 (Shift-02)
(a) 11488.67 cm³ (b) 11598.67 cm³
(c) 11478.67 cm³ (d) 11498.67 cm³

465. Two metallic balls P and Q are such that the diameter of P is four times the diameter of Q. What is the ratio between the volumes of P and Q?
SSC CPO 05/10/2023 (Shift-02)
(a) 8 : 1 (b) 16 : 1
(c) 64 : 1 (d) 32 : 1

466. As air is pumped into a spherical balloon, its radius increases from 7 cm to 14 cm. Find the ratio of volume of the balloon's in both circumstances.
SSC CHSL 27/05/2022 (Shift-01)
(a) 2 : 5 (b) 1 : 9
(c) 1 : 8 (d) 3 : 7

467. The volumes of two spheres are in the ratio of 512: 3375. The ratio of their surface areas is:
SSC CPO 27/06/2024 (Shift-02)
(a) 64 : 225 (b) 49 : 325
(c) 27 : 144 (d) 68 : 125

468. Find the total surface area of a sphere whose volume is $\frac{256}{3}\pi$ cm³.
SSC CPO 04/10/2023 (Shift-01)
(a) 48π cm² (b) 64π cm²
(c) 38π cm² (d) 56π cm²

469. The volume of a sphere is given by 130977 cm³. Its surface area (in cm²) is:
SSC CPO 04/10/2023 (Shift-01)
(a) 16847 (b) 12474
(c) 17424 (d) 14274

470. If the volume of a sphere is 38808 cm³, then its surface area is:
SSC CPO 04/10/2023 (Shift-03)
(a) 5564 cm² (b) 5544 cm²
(c) 5554 cm² (d) 5574 cm²

471. If the volume of a sphere is 24,416.64 cm³, find its surface area (take $\pi = 3.14$) correct to two places of decimal.
SSC CGL 03/12/2022 (Shift-01)
(a) 3069.55 cm² (b) 4069.44 cm²
(c) 5069.66 cm² (d) 6069.67 cm²

472. Let x cm² be the surface area and y cm³ be the volume of a sphere such that $y = 14x$. What is the radius (in cm) of the sphere?
SSC CGL 13/04/2022 (Shift-03)
(a) 51 (b) 102
(c) 42 (d) 68

473. The ratio of the total surface area and volume of a sphere is 2 : 7. Its radius is:
SSC CPO 25/11/2020 (Shift-02)
(a) 7 cm (b) 10 cm
(c) 10.5 cm (d) 7.5 cm

474. The volumes of spheres A and B are in the ratio 125 : 64. If the sum of the radii of A and B is 36 cm, then what is the surface area (in sq. cm) of A?
SSC CGL 09/03/2020 (Shift-02)
(a) 512π (b) 1600π
(c) 800π (d) 1024π

475. A sphere and a cube have equal surface areas. The ratio of the volume of the sphere to that of the cube is:
SSC Phase-XII 25/06/2024 (Shift-04)
(a) $\sqrt{3}:\sqrt{\pi}$ (b) $\sqrt{2}:\sqrt{\pi}$
(c) $\sqrt{\pi}:\sqrt{8}$ (d) $\sqrt{6}:\sqrt{\pi}$

476. What is the difference in the volume (in cm³) of a sphere of radius 7cm and that of a cone of radius 7 cm and height 10 cm? [Take $\pi = 22/7$]
SSC CGL 12/04/2022 (Shift-01)
(a) 205 (b) 704
(c) 924 (d) 1078

477. Find the number of paper balls, each 2 cm in diameter, that can be made from a sphere of diameter 18 cm.
SSC CHSL 09/07/2024 (Shift-04)
(a) 484 (b) 625
(c) 729 (d) 1020

478. The sum of the radii of spheres A and B is 14 cm, the radius of A being larger than that of B. The difference between their surface area is 112π. What is the ratio of volumes of A and B?
SSC CGL TIER-II 15/10/2020
(a) 64 : 27 (b) 8 : 1
(c) 125 : 64 (d) 27 : 8

479. One laddoo with a radius of 5 cm belongs to a shopkeeper. How many laddoo of radius 2.5 cm may be created from the same one laddoo?

SSC CPO 28/06/2024 (Shift-01)

(a) 2 (b) 6
(c) 4 (d) 8

480. A shopkeeper usually makes a large gram flour laddu (circular in shape) of radius 9 cm. How many gram flour laddus of radius 3 cm can be made from this big gram flour laddu? [Take $\pi = 22/7$]

SSC CHSL 04/08/2023 (Shift-03)

(a) 27 (b) 9
(c) 18 (d) 36

• TYPE – VIII •
SPHERICAL SHELL

481. The radius of the hollow sphere is 21 cm. It is cut into two equal halves by a plane passing through its center. What is 75% of the curved surface area (in cm², rounded off to the nearest tens) of the hemispheres? [Take $\pi = 22/7$]

SSC CPO 09/11/2022 (Shift-03)

(a) 4160 (b) 3470
(c) 2080 (d) 2270

482. A hollow sphere has an outer radius of 4 cm and inner radius of 1 cm. What is the volume of this hollow sphere?

SSC CGL 05/12/2022 (Shift-03)

(a) 84π cm³ (b) 68π cm³
(c) 48π cm³ (d) 92π cm³

483. What is the volume (in cm³) of a spherical shell whose inner and outer radii are respectively 2 cm and 3 cm?

SSC CGL 17/08/2021 (Shift-02)

(a) $\frac{76\pi}{3}$ (b) $\frac{106\pi}{3}$
(c) $\frac{56\pi}{3}$ (d) $\frac{86\pi}{3}$

• TYPE – IX •
HEMISPHERE

484. If the diameter of a hemisphere is 21 cm, then the curved surface area (in cm²) of the hemisphere is: [Take $\pi = 22/7$]

SSC CHSL 02/07/2024 (Shift-01)

(a) 939 (b) 693
(c) 963 (d) 639

485. The dome of a residential tower is in the form of a hemisphere with radius of 560 cm. Find the cost of painting it at the rate of ₹25 per m². [Take $\pi = 22/7$]

SSC CHSL 07/08/2023 (Shift-01)

(a) ₹4,928 (b) ₹4,982
(c) ₹4,298 (d) ₹4,289

486. A hemispherical dome of a building needs to be painted. If the circumference of the base of the dome is 154 cm, then find the cost of painting it if the cost of painting is ₹4 per 100 cm² [Take $\pi = 22/7$]

SSC CHSL 10/08/2023 (Shift-04)

(a) ₹150.92 (b) ₹150.66
(c) ₹105.29 (d) ₹105.66

487. A hemispherical bowl made of iron has inner diameter 84 cm. Find the cost of tin plating it on the inside at the rate of ₹21 per 100 cm² [Take $\pi = 22/7$] correct to two places of decimal.

SSC CGL 02/12/2022 (Shift-01)

(a) ₹2,328.48 (b) ₹2,425.48
(c) ₹2,425.60 (d) ₹2,355.48

488. A hemisphere has a radius of 6.2 cm. Find its total surface area (use $\pi = 3.14$) (round off two decimal places.)

SSC CHSL 02/07/2024 (Shift-03)

(a) 282.25 cm² (b) 358.52 cm²
(c) 276.35 cm² (d) 362.10 cm²

489. Find the total surface area of a hemisphere with a radius of 11 cm?

SSC CPO 27/06/2024 (Shift-02)

(a) 242π cm² (b) 313π cm²
(c) 273π cm² (d) 363π cm²

490. The total surface area of a solid hemisphere of diameter 28 cm is:

SSC CHSL 04/07/2024 (Shift-03)

(a) 1784 cm² (b) 1488 cm²
(c) 1648 cm² (d) 1848 cm²

491. Determine the total surface area of a hemisphere closed at bottom. Radius of the hemisphere is $\sqrt{\frac{25}{\pi}}$ unit.

SSC CPO 09/11/2022 (Shift-01)

(a) 75 unit² (b) 70 unit²
(c) 60 unit² (d) 50 unit²

492. A solid sphere has a surface area of 616 cm². This sphere is now cut into two hemispheres. What is the total surface area of one of the hemispheres?

SSC PHASE-XI 28/06/2023 (Shift-01)

(a) 440 cm² (b) 462 cm²
(c) 452 cm² (d) 390 cm²

493. The diameter of a hemisphere is equal to the diagonal of a rectangle of length 4 cm and breadth 3 cm. Find the total surface area (in cm²) of the hemisphere.

SSC CPO 04/10/2023 (Shift-03)

(a) 25π (b) $\frac{50\pi}{4}$
(c) $\frac{25\pi}{4}$ (d) $\frac{75\pi}{4}$

494. A hemispherical bowl has 21 cm radius. It is to be painted inside as well as outside. The cost of painting it at the rate of ₹0.05 per cm² and assuming that the thickness of the bowl is negligible, is: [Use $\pi = 22/7$]

SSC Phase-XII 24/06/2024 (Shift-02)

(a) ₹188.30 (b) ₹410.10
(c) ₹277.20 (d) ₹388.20

495. If the radius of a hemispherical balloon increases from 4 cm to 7 cm as air is pumped into it, find the ratio of the surface area of the new balloon to its original.

SSC CPO 04/10/2023 (Shift-01)

(a) 20 : 49 (b) 16 : 21
(c) 49 : 16 (d) 21 : 12

496. The curved surface area of a solid hemisphere is 22 cm². What is the total surface area of the hemisphere? [Use $\pi = 22/7$]

SSC CGL TIER-II 08/08/2022

(a) 66 cm² (b) 30 cm²
(c) 44 cm² (d) 33 cm²

497. A solid sphere of diameter 7 cm is cut into two equal halves. What will be the increase in its total surface area?

SSC CHSL 21/03/2023 (Shift-04)

(a) 77 cm² (b) 60.5 cm²
(c) 65.5 cm² (d) 55 cm²

498. What will be the difference between the total surface area and the curved surface area of a hemisphere having 4 cm diameter?

SSC CPO 03/10/2023 (Shift-02)

(a) 4.4π cm² (b) 5π cm²
(c) 4π cm² (d) 8π cm²

499. The radius of a hemispherical bowl is 9 cm. The capacity of the bowl is: [Use $\pi = 22/7$]

SSC CPO 28/06/2024 (Shift-01)

(a) 1527.43 cm³ (b) 1428.78 cm³
(c) 1625.37 cm³ (d) 1821.47 cm³

500. Find the volume (in cm³) of a hemisphere of radius 18 cm. [Use $\pi = 22/7$] (Rounded off to two decimal places)

SSC CPO 29/06/2024 (Shift-02)

(a) 11250.25 (b) 12200.43
(c) 18750.23 (d) 12219.43

501. How many liters of water can a hemispherical tank of radius 2.1m contain? [Take $\pi = 22/7$]

SSC CHSL 04/08/2023 (Shift-04)

(a) 18984 (b) 19324
(c) 18404 (d) 19404

502. The volume of the hemisphere (to the nearest integer) with a radius of 5.5 cm is: (use $\pi = 3.14$)

SSC CHSL 10/07/2024 (Shift-02)

(a) 378 cm³ (b) 325 cm³
(c) 348 cm³ (d) 362 cm³

503. If the diameter of a hemisphere is 42 cm, then the volume of hemisphere (in cm³) is: Take $\pi = \frac{22}{7}$

SSC CHSL 02/07/2024 (Shift-03)

(a) 19404 (b) 19444
(c) 19154 (d) 19254

504. The diameter of a hemispherical bowl is 21 cm. The volume of the bowl is equal to: [Take $\pi = 22/7$]

SSC CHSL TIER-II 02/11/2023

(a) 2,425.5 cm³
(b) 2,524.5 cm³
(c) 2,725.5 cm³
(d) 2,624.5 cm³

505. The total surface area of a solid hemisphere is 4158 cm². Find its volume (in cm³).

SSC CPO 05/10/2023 (Shift-01)

(a) 9702 (b) 19404
(c) 1848 (d) 462

506. A hemispherical bowl whose radius is 21 cm is full of ice cream. Find the volume of the ice cream.
[Take $\pi = 22/7$]
SSC CPO 09/11/2022 (Shift-02)
(a) 20000 cm^3 (b) 21000 cm^3
(c) 22000 cm^3 (d) 19404 cm^3

507. A sphere and another solid hemisphere have the same surface area. The ratio of their volumes is:
SSC CPO 05/10/2023 (Shift-02)
(a) $2\sqrt{3}:8$ (b) $3\sqrt{3}:8$
(c) $\sqrt{3}:4$ (d) $3\sqrt{3}:4$

508. A hemispherical bowl is 88 cm round the brim. Assuming it to be full, how many persons may be served from it in hemispherical glasses, 7 cm in diameter at the top? (Where $\pi = 22/7$)
SSC CPO 27/06/2024 (Shift-01)
(a) 74 (b) 68
(c) 64 (d) 70

509. If the radius of a sphere is thrice than the radius of the hemisphere, then what will be the respective ratio of their volumes?
SSC CHSL 14/03/2023 (Shift-01)
(a) 27 : 1 (b) 16 : 1
(c) 54 : 1 (d) 18 : 1

◆ TYPE – X ◆
HEMISPHERICAL SHELL

510. The internal diameter of a hollow hemispherical vessel is 24 cm. It is made of a steel sheet which is 0.5 cm thick. What is the total surface area (in cm^2) of the vessel ?
SSC CGL TIER-II 13/09/2019
(a) 612.75π (b) 468.75π
(c) 600.2π (d) 600.5π

511. The inner and outer radii of a hemispherical wooden bowl are 6 cm and 8 cm, respectively. Its entire surface has to be polished and the cost of polishing π cm^2 is Rs.50. How much will it cost to polish the bowl?
SSC CHSL 08/07/2024 (Shift-04)
(a) Rs.12,000
(b) Rs.10,000
(c) Rs.11,600
(d) Rs.11,400

512. The internal and external radii of a hollow hemispherical vessel are 6 cm and 7 cm respectively. What is the total surface are (in cm^2) of the vessel?
SSC CGL TIER-II 11/09/2019
(a) 183π (b) 189π
(c) 177π (d) 174π

513. A hemispherical bowl is made of 1 cm thick steel. The inside radius of the bowl is 4cm. The volume of the steel (in cm^3) used in making the bowl is:
SSC CHSL 17/08/2023 (Shift-02)
(a) $40\frac{2}{3}\pi$ (b) $27\frac{1}{3}\pi$
(c) $41\frac{1}{3}\pi$ (d) $35\frac{1}{3}\pi$

514. If the inner radius of a hemispherical bowl is 5 cm and its thickness is 0.25 cm, then find the volume of the material required in making the bowl, [Take $\pi = 22/7$] (Rounded up to two places of decimals)
SSC CGL 21/07/2023 (Shift-04)
(a) 34 cm^3 (b) 44 cm^3
(c) 45.34 cm^3 (d) 41.28 cm^3

515. A hemispherical bowl is made of silver and has an inner diameter of 4 cm if the thickness of silver is 0.5 cm. Find the volume of silver used in making the bowl correct to two places of decimals (use $\pi = 3.14$).
SSC CHSL 11/07/2024 (Shift-02)
(a) 15.96 cm^3 (b) 51.96 cm^3
(c) 15.69 cm^3 (d) 51.69 cm^3

◆ TYPE – XI ◆
CONCEPT OF MELTING & RECASTING

516. If a cuboid of dimensions 32 cm × 12cm × 9cm is melted into two cubes of same size, what will be the ratio of the surface area of the cuboid to the total surface area of the two cubes?
SSC CGL TIER-II 11 /09/2019
(a) 65:72 (b) 37:48
(c) 24:35 (d) 32:39

517. A large solid cube is melted and cast into 'N' small solid spheres, each of radius 3 cm, and 'N + 2' small solid cuboids, each of dimensions 4 cm × 4 cm × 6.5 cm. If the length of each side of the large solid cube is 12 cm, then find the value of 'N'. [Take $\pi = 22/7$]
SSC MTS 20/07/2022 (Shift-02)
(a) 8 (b) 5
(c) 7 (d) 6

518. A cylindrical metallic rod of diameter 2 cm and length 45 cm is melted and converted into wire of uniform thickness and length 5 m. The diameter of the wire is:
SSC CPO 04/10/2023 (Shift-03)
(a) 5 mm (b) 3 mm
(c) 2 mm (d) 6 mm

519. The ratio of the diameters of two spheres is given as 1 : 4. The larger sphere is melted and 125 identical spheres are made out of the molten material. The smaller sphere is melted and 27 identical spheres are made out of the molten material. If the ratio of the volume of each of the 125 identical spheres to the volume of each of the 27 identical spheres is given as 1 : m, what is the value of m?
SSC CHSL 01/07/2024 (Shift-01)
(a) $\frac{1728}{125}$ (b) $\frac{27}{8000}$
(c) $\frac{125}{1728}$ (d) $\frac{64}{3375}$

520. The radii of the ends of a frustum of a solid right-circular cone 45 cm high are 28 cm and 7 cm. If this frustum is melted and reconstructed into a solid right circular cylinder whose radius of base and height are in the ratio 3: 5, find the curved surface area (in cm^2) of this cylinder.
[Take $\pi = 22/7$]
SSC CPO 03/10/2023 (Shift-01)
(a) 4610 (b) 4620
(c) 4640 (d) 4680

521. A frustum of a right circular cone whose height is 18 cm, large base radius is 25 cm and small base radius is 20 cm, is melted to form a small sphere of diameter 2 cm. How many spheres will be formed?
SSC CPO 09/11/2022 (Shift-02)
(a) 6287 (b) 6862
(c) 4575 (d) 5857

522. 3 solid spheres of diameters 6 cm, 8 cm and 10 cm are melted together to form a single solid sphere. Find its radius.
SSC CHSL 04/07/2024 (Shift-04)
(a) 12 cm (b) 9 cm
(c) 3 cm (d) 6 cm

523. A solid copper sphere of radius 9 cm is drawn in to a wire of radius 4mm. Find the length of the wire.
SSC CHSL 05/07/2024 (Shift-02)
(a) 60.75 m (b) 70.25 m
(c) 65.25 m (d) 20.75 m

524. If three spheres of radius 75cm, 60 cm and 45 cm are melted into one big sphere, then the radius of the big sphere is;
SSC CHSL 05/07/2024 (Shift-03)
(a) 90 cm (b) 85 cm
(c) 95 cm (d) 80 cm

525. A solid metallic cube having surface area of 54 cm^2 is melted to form smaller cubes of surface area $\frac{8}{12}$ cm^2 each. Find the number of smaller cubes.
SSC CHSL 03/07/2024 (Shift-03)
(a) 729 (b) 216
(c) 343 (d) 512

526. A metallic sphere of volume 3136π cm^3 is melted and then, recast into smaller, cones each of radius 3.5 cm and height 4 cm. How many cones are obtained?
SSC CHSL 09/07/2024 (Shift-04)
(a) 148 (b) 192
(c) 196 (d) 172

527. A cylinderical rod of iron whose height is twelve items its radius, is melted and cast into spherical balls, each of one-third the radius of the cylinder. Find the number of spherical balls.
SSC CHSL 03/07/2024 (Shift-04)
(a) 224 (b) 212
(c) 243 (d) 198

528. Three solid cubes of metal have sides 6 cm, 8 cm and 10 cm, respectively. They are melted to form a new cube. What is the surface area of this new cube?

SSC CHSL 04/07/2024 (Shift-01)

(a) 915 cm^2 (b) 864 cm^2
(c) 950 cm^2 (d) 812 cm^2

529. A solid metallic cylinder of base radius 6 cm and height 10 cm is melted to form small cylinders, each of height 2.5 cm and base radius 2 cm. Find the number of small cylinders.

SSC CHSL 08/07/2024 (Shift-03)

(a) 360 (b) 36
(c) 32 (d) 80

530. A cylindrical candle, 14 cm in diameter and length 2 cm is melted to form a cuboid candle of dimensions 7 cm × 11 cm × 2 cm. How many cuboidal candles can be obtained?

SSC CHSL 11/07/2024 (Shift-04)

(a) 4 (b) 5
(c) 2 (d) 3

531. A solid metallic sphere of radius 6 cm is melted and recast into spherical balls of radius 3 cm. The number of spherical balls thus obtained is:

SSC CHSL 11/07/2024 (Shift-01)

(a) 8 (b) 4
(c) 6 (d) 10

532. A solid sphere of radius 8 cm is melted and then recast into small spherical balls each of diameter 4 cm. Find the number of balls thus obtained (used $\pi = \frac{22}{7}$).

SSC CHSL 08/07/2024 (Shift-01)

(a) 24 (b) 64
(c) 32 (d) 48

533. A metallic solid cuboid of dimensions 36 cm × 22 cm × 12 cm is melted and recast in the form of cubes of side 6cm. Find the number of the cubes so formed.

SSC CHSL 08/07/2024 (Shift-02)

(a) 46 (b) 45
(c) 33 (d) 44

534. A copper sphere of diameter 12 cm is drawn into a wire of diameter 4 mm. What is the length (in cm) of the wire? (Use $\pi = 22/7$)

SSC CPO 27/06/2024 (Shift-02)

(a) 7200 (b) 7823
(c) 8342 (d) 9000

535. A hollow sphere of external and internal diameters of 10 cm and 6 cm, respectively, is melted and made into another solid in the shape of a right circular cone of base diameter 10 cm. Find the height of the cone.

SSC CPO 28/06/2024 (Shift-02)

(a) 13.68 cm (b) 14.68 cm
(c) 16.68 cm (d) 15.68 cm

536. A solid metal cylinder of 12 cm height and 7 cm radius is melted and recast into two cones in the proportion of 1: 2 (volume), keeping the height 12 cm. What would be the percentage change in the flat surface area before and after

[Use $\pi = 22/7$]

SSC CPO 28/06/2024 (Shift-03)

(a) 35% (b) 20%
(c) 45% (d) 50%

537. Melting a metal ball of radius 3 units, 27 identical dice and a ball of radius 1 units are made. What is the side of dice?

SSC CPO 29/06/2024 (Shift-02)

(a) 1.7 units (b) 1.5 units
(c) 1.6 units (d) 1.4 units

538. A solid cube, whose each edge is of length 48 cm, is melted. Identical solid cubes, each of volume 64 cm^3, are made out of this molten cube, without any wastage. How many such small cubes are obtained?

SSC CGL TIER-II 26/10/2023

(a) 1738 (b) 1728
(c) 1718 (d) 1748

539. A solid sphere made of wax of radius 12 cm is melted and cast into solid hemispheres of radius 4 cm each. Find the number of such solid hemispheres.

SSC CPO 03/10/2023 (Shift-03)

(a) 14 (b) 54
(c) 28 (d) 27

540. The radius of a metallic spherical ball is 3 cm. If the metallic ball is melted and recast into x number of hemispheres of radius equal to half the radius of the metallic spherical ball, then find the value of x.

SSC CPO 05/10/2023 (Shift-03)

(a) 14 (b) 16
(c) 13 (d) 15

541. The diameter of a metallic sphere is 6 cm. It is melted and drawn into a wire having a diameter of the cross section as 0.4 cm. Find the length of the wire (in meters).

SSC MTS 01/09/2023 (Shift-01)

(a) 10 (b) 9
(c) 18 (d) 12

542. A cuboid with dimension 2 × 4 × 1 units is melted and a new cube is made. What is the total surface area of the cube formed in square units?

SSC MTS 01/09/2023 (Shift-02)

(a) 16 (b) 32
(c) 24 (d) 28

543. Two cuboids of dimension 2 × 3 × 4 units and 2 × 5 × 4 units are melted and a single cube is made. What is the side of the cube in units?

SSC MTS 13/09/2023 (Shift-02)

(a) 4.0 (b) 3.5
(c) 3.0 (d) 2.5

544. A solid metallic cuboid of length 11 cm, breadth 8 cm and height 6 cm is melted and reshaped to form a cone of height 14 cm. What is the radius of the cone thus formed?

SSC MTS 13/09/2023 (Shift-03)

(a) 8 cm (b) 7 cm
(c) 6 cm (d) 9 cm

545. The sides of three cubes of metal are 15 cm, 18 cm and 25 cm, respectively. Find the side (in cm) of the new cube formed by melting these cubes together

SSC CHSL 04/08/2023 (Shift-02)

(a) $9\sqrt[3]{388}$ (b) $6\sqrt[3]{388}$
(c) $7\sqrt[3]{388}$ (d) $4\sqrt[3]{388}$

546. A solid rectangular block of metal of dimensions 88 cm × 21 cm × 21 cm, is melted to form a solid sphere. What is its radius (in cm)? [Take $\pi = 22/7$]

SSC CHSL 07/08/2023 (Shift-02)

(a) 28 (b) 35
(c) 21 (d) 14

547. How many solid spheres are made if a metallic cone of radius 12 cm and height 24 cm is melted into sphere of radius 2 cm each?

SSC CHSL 08/08/2023 (Shift-03)

(a) 105 (b) 101
(c) 108 (d) 103

548. A solid cuboid is melted to form a number of cubes, If the length, breadth and height of cuboid are 20 cm, 16 cm and 8 cm and the edge of each cube is 4 cm, then the number of cubes is:

SSC CHSL 09/08/2023 (Shift-02)

(a) 50 (b) 44
(c) 40 (d) 48

549. A metallic sphere of radius 21 cm is melted and then recast into smaller cones each with a radius of 7 cm, and a height of 3 cm. Find the number of cones obtained.

SSC CHSL 11/08/2023 (Shift-04)

(a) 225 (b) 325
(c) 522 (d) 252

550. A solid sphere of radius 4 cm is melted and cast into the shape of a solid cone of height 4 cm. The radius of the base of the cone is ....

SSC CHSL 17/08/2023 (Shift-03)

(a) 8 cm (b) 4 cm
(c) 6 cm (d) 10 cm

551. A spherical ball of lead, 3 cm in diameter is melted and recast into three spherical balls. The diameters of two of these balls are $\frac{3}{2}$ cm and 2 cm, respectively. Find the diameter of the third ball.

SSC CGL 17/07/2023 (Shift-04)

(a) 2.1 cm (b) 3.3 cm
(c) 3 cm (d) 2.5 cm

552. Three cubes with sides in the ratio of 3:4:5 are melted to form a single cube whose diagonal is $18\sqrt{3}$ cm. The sides of the three cubes are:

SSC CGL 20/07/2023 (Shift-01)

(a) 21 cm, 28 cm and 35 cm
(b) 9 cm, 12 cm and 15 cm
(c) 18 cm, 24 cm and 30 cm
(d) 12 cm, 16 cm and 20 cm

553. The internal and external diameters of a hollow hemispherical bowl are 6 cm and 10 cm, respectively. If it is melted and recast into a solid cylinder of diameter 14 cm, what is the height of the cylinder in cm?

SSC Phase-XI 27/06/2023 (Shift-01)

(a) 1.1 cm (b) 1.22 cm
(c) 1.33 cm (d) 1 cm

554. Melting a hemisphere of radius 7 cm, four small identical spheres are made. What is the radius of these spheres?

SSC Phase-XI 27/06/2023 (Shift-03)

(a) 3 cm (b) 3.5 cm
(c) 4 cm (d) 4.5 cm

555. A solid iron sphere of radius 21 cm is melted down into a cone of height 84 cm. What will be the radius of the cone?

SSC Phase-XI 28/06/2023 (Shift-04)

(a) 24 cm (b) 28 cm
(c) 32 cm (d) 21 cm

556. How many solid spherical balls of radius 6 cm can be made by melting a solid hemisphere of radius 12 cm?

SSC CHSL 13/03/2023 (Shift-01)

(a) 4 (b) 2
(c) 10 (d) 8

557. 24 equal solid hemispheres are melted to form a right circular cylinder of radius 12 cm and height 24 cm. Find the radius of each solid hemisphere.

SSC CHSL 15/03/2023 (Shift-01)

(a) 6 cm (b) 8 cm
(c) 3 cm (d) 4 cm

558. Three metallic cubes whose sides are 6 cm, 8 cm and 10 cm respectively are melted and converted into a single cube. If there is no loss, of metal in this process, then what is the length of the side of the new cube?

SSC CHSL 21/03/2023 (Shift-03)

(a) 16 cm (b) 14 cm
(c) 12 cm (d) 20 cm

559. How many spherical lead shots each of diameter 8.4 cm can be obtained from a rectangular solid of lead with dimension 88 cm, 63 cm, 42 cm [Take $\pi = 22/7$]

SSC CGL 01/12/2022 (Shift-01)

(a) 920 (b) 750
(c) 650 (d) 860

560. A copper sphere of diameter 18 cm is drawn into a wire of diameter 6 mm. Find the length of the wire.

SSC CGL 01/12/2022 (Shift-03)

(a) 143 m (b) 108 m
(c) 324 m (d) 234 m

561. A cuboid of length 36 m, breadth 18 m and height 9 m is melted and recast into a cube. Find the length of the diagonal of the cube.

SSC CGL 02/12/2022 (Shift-01)

(a) $18\sqrt{3}$ m (b) $15\sqrt{3}$ m
(c) $12\sqrt{3}$ m (d) $17\sqrt{3}$ m

562. A solid hemisphere has radius 21 cm. It is melted to form a cylinder such that the ratio of its curved surface area to total surface area is 2 : 5. What is the radius (in cm) of its base [Take $\pi = 22/7$]?

SSC CGL 06/12/2022 (Shift-01)

(a) 23 (b) 21
(c) 17 (d) 19

563. An iron rod with diameter 4 cm and length 12 cm is drawn into a wire of length 12 m of uniform thickness. Determine the thickness of the wire.

SSC CGL 08/12/2022 (Shift-02)

(a) 0.6 cm (b) 0.7 cm
(c) 0.3 cm (d) 0.4 cm

564. A cuboid of sides 12 cm, 18 cm and 27 cm is melted to form a cube. What is the ratio of the total surface area of the cuboid to that of the cube?

SSC CGL 08/12/2022 (Shift-04)

(a) 18 : 17 (b) 17 : 19
(c) 19 : 18 (d) 17 : 23

565. The number of solid spheres, each of diameter 6 cm, that could be moulded to form a solid metal cylinder of height 90 cm and diameter 4 cm is:

SSC CGL 09/12/2022 (Shift-04)

(a) 10 (b) 14
(c) 16 (d) 13

566. The total surface area of a solid metallic hemisphere is 462 cm^2. This is melted and moulded into a right circular cone. If the radius of the base of the cone is the same as that of the hemisphere, then its height is: [Take $\pi = 22/7$]

SSC CPO 09/11/2022 (Shift-03)

(a) 14 cm (b) 7 cm
(c) 21 cm (d) 28 cm

567. Radius of a large solid sphere is 14 cm. It is melted to form 8 equal small solid sphere. What is the sum of total surface areas of all the 8 small solid spheres?

SSC CGL TIER-II (08/08/2022)

(a) 3648 cm^2 (b) 4244 cm^2
(c) 4158 cm^2 (d) 4928 cm^2

568. The radius of a solid sphere is 42 cm. It is melted to form identical small solid spheres whose radius is 7 cm. What is the number of small solid spheres obtained?

SSC CGL TIER-II 08/08/2022

(a) 125 (b) 36
(c) 216 (d) 64

569. A metallic solid cuboid of dimensions 36 cm × 18 cm × 12 cm is melted and recast in the form of cubes of side 6 cm. Find the number of cubes so formed.

SSC CHSL 24/05/2022 (Shift-01)

(a) 38 (b) 40
(c) 34 (d) 36

570. 15 identical solid spherical balls of radius 5 cm are melted to form a single sphere. In this process, 35% of the mass is wasted. What is the radius (in cm) of the single sphere that is now formed? [Give your answer correct to two decimal places.] [Take $\pi = 22/7$]

SSC CHSL 26/05/2022 (Shift-03)

(a) 12.68 cm (b) 16.68 cm
(c) 10.68 cm (d) 34.68 cm

571. How many small solid spheres each of 5 mm radius can be made out of a metallic solid cone whose base has radius 21 cm and height 30 cm?

SSC CGL 12/04/2022 (Shift-03)

(a) 32000 (b) 26460
(c) 25000 (d) 18260

572. A solid cone of radius 7 cm and height 7 cm was melted along with two solid spheres of radius 7 cm each to form a solid cylinder of radius 7 cm. What is the curved surface area (in cm^2) of the cylinder? [Take $\pi = 22/7$]

SSC CGL 21/04/2022 (Shift-02)

(a) 880 (b) 482
(c) 2196 (d) 924

573. The area of three adjacent faces of a cuboidal solid block of wax are 216 cm^2, 96 cm^2 and 144 cm^2. It is melted and 8 cubes of the same size are formed from it. What is the lateral surface area (in cm^2) of 3 such cubes?

SSC CGL TIER-II 03/02/2022

(a) 648 (b) 432
(c) 576 (d) 288

574. A solid metallic cube of side 9 cm and a solid metallic cuboid having dimensions 5 cm, 13 cm, 31 cm melted and recast into a single cube. What is the total surface area (in cm^2) of the new cube?

SSC CPO 23/11/2020 (Shift-02)

(a) 865 (b) 1362
(c) 1176 (d) 2744

575. A woman working in a company was supplied a rectangular solid (cuboid shape) of wax with dimensions 70 cm , 44 cm and 20 cm to prepare cylindrical candles, each 14 cm in diameter and 20 cm of height. Find the number of candles.

SSC CPO 29/06/2024 (Shift-01)

(a) 15 (b) 20
(c) 10 (d) 30

◆ TYPE – XII ◆
CONCEPT OF DIGGING & EARTH TAKEN OUT

576. A well with inner radius 3 m, is dug 6 m deep. The soil taken out of it has been spread evenly all around it to a width of 2 m to form an embankment. The height (in m) of the embankment is:

SSC CGL TIER-II 03/02/2022

(a) $4\frac{1}{2}$ (b) $4\frac{1}{4}$
(c) $3\frac{1}{4}$ (d) $3\frac{3}{8}$

577. A well with 14 cm radius is dug 23 cm deep. Find the volume of the earth taken out of it.

SSC CGL 25/09/2024 (Shift-03)

(a) 14,178 cm^3 (b) 14,108 cm^3
(c) 14,168 cm^3 (d) 15,168 cm^3

◆ TYPE – XIII ◆
FILLING A CONTAINER BY ANOTHER SHAPE CONTAINER

578. Some medicine in liquid form is prepared in a hemispherical container of diameter 36 cm. When the container is full of medicine, the medicine is transferred to small cylindrical bottles of diameter 6 cm and height 6 cm. How many bottles are required to empty the container?

SSC CPO 04/10/2023 (Shift-02)

(a) 70 (b) 75
(c) 72 (d) 76

579. A conical vessel, whose internal radius is 20 cm and height is 27 cm, is full of water. If this water is poured into a cylindrical vessel with internal radius 15cm, what will be the height to which the water rises in it?

SSC CGL 12/12/2022 (Shift-04)

(a) 16 cm (b) 10 cm
(c) 12 cm (d) 14 cm

580. A hemispherical bowl of internal radius 6 cm contains a liquid. This liquid is to be filled into cylindrical shaped small bottels of diameter 2 cm and height 4 cm. How many bottles will be need to empty the bowl?

SSC CPO 11/11/2022 (Shift-02)

(a) 32 (b) 37
(c) 38 (d) 36

581. A hemispherical bowl of internal radius 18 cm is full of liquid. This liquid is to be filled in cylindrical bottles each of radius 3 cm and height 6 cm. How many bottles are required to empty the bowl?

SSC CGL TIER-II 03/03/2023

(a) 72 (b) 70
(c) 68 (d) 66

582. Water is pouring into a cuboidal reservoir at the rate of 50 liters per minute. The volume of the reservoir is 120 m³. How many hours will it take to fill the reservoir?

SSC MTS 04/09/2023 (Shift-03)

(a) 30 (b) 40
(c) 35 (d) 45

◆ TYPE – XIV ◆
CONCEPT OF RISE IN HEIGHT

583. A cylinder has some water in it at a height of 16 cm. If a sphere of radius 9 cm is put into it, then find the rise in the height of the water if the radius of the cylinder is 12 cm.

SSC CPO 05/10/2023 (Shift-01)

(a) 6 cm (b) 8.75 cm
(c) 8 cm (d) 6.75 cm

584. Some ice pieces, spherical in shape, of diameter 6 cm are dropped in a cylindrical container containing some juice and are fully submerged. If the diameter of the container is 18 cm and level of juice rises by 40 cm, then how many ice pieces are dropped in the container?

SSC CPO 05/10/2023 (Shift-03)

(a) 90 (b) 80
(c) 85 (d) 95

◆ TYPE – XV ◆
COMBINATION OF 3D FIGURES

585. A right circular cone is inscribed in a cube of side 9 cm occupying the maximum space possible. What is the ratio of the volume of the cube to the volume of the cone? [Take $\pi = 22/7$]

SSC MTS 18/10/2021

(a) 22 : 81 (b) 42 : 11
(c) 11 : 42 (d) 81 : 22

586. A solid toy is in the shape which is a combination of a cylinder, cone and a hemispherical bowl. The cylinder contributes to 50% of the total volume of the toy, the cone contributes to 20% of the volume. Find the ratio of the contribution (in terms of volume) of the cone, cylinder and hemisphere.

SSC CHSL 30/05/2022 (Shift-02)

(a) 2 : 3 : 5
(b) 5 : 2 : 3
(c) 2 : 5 : 3
(d) 4 : 5 : 3

587. A largest possible sphere is carved from a cube of side 14 cm. What is its volume in cm³?

SSC CHSL 01/07/2024 (Shift-01)

(a) $1600\frac{1}{3}$ (b) $1437\frac{1}{3}$
(c) $205\frac{1}{3}$ (d) $1707\frac{1}{3}$

588. A sphere passes through the eight corners of a cube of side 14 cm. Find the volume (in cm³) of the sphere. [Take $\pi = 22/7$]

SSC CHSL 25/05/2022 (Shift-01)

(a) $4312\sqrt{3}$ (b) $4012\sqrt{3}$
(c) $4312\sqrt{2}$ (d) $4012\sqrt{2}$

589. Find the volume of the largest right circular cone that can be cut out from a cube whose edge is $3\frac{1}{2}$ cm, correct to two places of decimals [Take $\pi = 22/7$]

SSC CHSL 07/08/2023 (Shift-04)

(a) 13.21 cm³ (b) 21.31 cm³
(c) 11.23 cm³ (d) 12.13 cm³

590. For making a toy, a hemisphere is attached at one end of a cylinder and a cone is attached at the other end of the cylinder. The cylinder, the cone and the hemisphere have a common radius of 4.2 cm. The height of the cylinder and that of the cone is 7 cm. Find the volume (in cm³) of the toy. (Use $\pi = \frac{22}{7}$)

SSC CHSL TIER-II (18/11/2024)

(a) 358.8 (b) 863.25
(c) 672.672 (d) 762.255

591. A hemispherical depression of diameter 4 cm is cut out from each face of a cubical block of sides 10 cm. Find the surface area of the remaining solid (in cm²). [Take $\pi = 22/7$]

SSC CGL 18/04/2022 (Shift-01)

(a) $900\frac{4}{7}$ (b) $700\frac{1}{7}$
(c) $675\frac{3}{7}$ (d) $112\frac{4}{7}$

592. The length of the largest possible rod that can be placed in a cubical room is $42\sqrt{3}$m. The surface area (in m²) of the largest possible sphere that fit within the cubical room is: [Use $\pi = 22/7$]

SSC CPO 27/06/2024 (Shift-02)

(a) 3590 (b) 4589
(c) 2564 (d) 5544

593. Find the volume of the largest possible sphere circumscribed by a cube of edge 7 cm.

SSC CHSL 03/08/2023 (Shift-02)

(a) 179.67cm³ (b) 169.67cm³
(c) 189.67cm³ (d) 199.67cm³

594. The Largest possible sphere is carved out of a cube of side 6 cm. What is the volume of the sphere?

SSC MTS 09/05/2023 (Shift-01)

(a) $\frac{792}{7}$ cm³ (b) $\frac{144}{7}$ cm³
(c) $\frac{133}{3}$ cm³ (d) $\frac{444}{7}$ cm³

595. The length of the side of a cube is 5.6 cm. What is the volume of the largest sphere that can be taken out of the cube?

SSC CGL 05/12/2022 (Shift-01)

(a) 91.98 cm³ (b) 99.96 cm³
(c) 96.98 cm³ (d) 90.69 cm³

596. A solid cone of height 42 cm with diameter of its base 42 cm is cut out from a wooden solid sphere of radius 24 cm. Find the percentage of wood wasted correct to two places of decimal.

SSC CGL 09/12/2022 (Shift-01)

(a) 75.56% (b) 56.65%
(c) 66.50% (d) 67.50%

597. What is the volume of the largest right circular cone that can be cut out from a cube whose edge is 10 cm?

SSC CHSL 26/05/2022 (Shift-01)

(a) $\frac{250\pi}{3}$ cm³ (b) $\frac{351\pi}{3}$ cm³
(c) $\frac{145\pi}{3}$ cm³ (d) $\frac{150\pi}{3}$ cm³

598. From a solid cylindrical wooden block of height 18 cm and radius 7.5 cm, a conical cavity of same radius and same height is taken out. What is total surface area (in cm²) of the remaining solid?

SSC CGL TIER-II 16/11/2020)

(a) 326.25π
(b) 416.25π
(c) 472.5π
(d) 270π

599. A right circular cylinder of maximum volume is cut out from a solid wooden cube. The material left is what percent of the volume (nearest to an integer) of the original cube?

SSC CGL TIER-II 11/09/2019

(a) 19
(b) 28
(c) 21
(d) 23

600. A sphere of maximum volume is cut out from a solid hemisphere. What is the ratio of the volume of the sphere to that of the remaining solid?

SSC CGL TIER-II 13/09/2019

(a) 1 : 4
(b) 1 : 2
(c) 1 : 3
(d) 1 : 1

601. A right triangle with sides 3 cm, 4 cm and 5 cm is rotated about the sides of 3 cm to form a cone. The volume of the cone so formed is:

SSC CGL 10/09/2024 (Shift-02)

(a) 20π cm³
(b) 16π cm³
(c) 25π cm³
(d) 28π cm³

602. Two rectangular sheets of paper, each 60 cm × 36 cm, are made into two right circular cylinders, one by rolling the paper along its length and the other along the breadth. The ratio of the volumes of the two cylinders, thus formed, is:

SSC CPO 29/06/2024 (Shift-03)

(a) 5 : 6
(b) 8 : 3
(c) 7 : 4
(d) 5 : 3

603. A rectangular piece of paper is 50 cm long and 22 cm wide. If a cylinder is formed by rolling the paper along its breadth, then the volume of the cylinder is:

SSC CGL 10/09/2024 (Shift-03)

(a) 2125 cm³
(b) 1925 cm³
(c) 2025 cm³
(d) 1825 cm³

• TYPE – XVI •
PRISM

604. The base of a right prism is an equilateral triangle whose side is 10 cm. If height of this prism is $10\sqrt{3}$ cm, then what is the total surface area of prism?

SSC CGL TIER-II (08/08/2022)

(a) $325\sqrt{3}$ cm²
(b) $350\sqrt{3}$ cm²
(c) $125\sqrt{3}$ cm²
(d) $150\sqrt{3}$ cm²

605. Let ABCDEF is prism whose base is a right triangle whose perpendicular sides are 9cm and 12 cm, if cost of painting the prism is ₹151.20 at the rate of 20 paise/cm² then find the height of the prism?

(a) 17 cm
(b) 15 cm
(c) 16 cm
(d) 18 cm

606. The base of a prism is a right angle triangle whose sides are 9 cm, 12 cm and 15 cm. Volume of this prism is 648 cm³. What will be the height of prism?

SSC CGL TIER-II 08/08/2022

(a) 14 cm
(b) 9 cm
(c) 16 cm
(d) 12 cm

607. The base of a right prism is an equilateral triangle whose each side is 4 cm. If the lateral surface area is 120 cm², find the volume (in cm³) of the prism.

SSC CHSL TIER-II 10/01/2024

(a) $10\sqrt{3}$
(b) $20\sqrt{3}$
(c) $30\sqrt{3}$
(d) $40\sqrt{3}$

608. The base of a solid prism of height 10 cm is a square and its volume is 160 cm³, What is its total surface area of the prism (in cm²) ?

SSC CGL TIER-II 16/10/2020

(a) 200
(b) 192
(c) 180
(d) 176

609. The base of a right prism is a triangle with sides 16 cm, 30 cm and 34 cm. Its height is 32 cm. The lateral surface area (in cm²) and the volume (in cm³) are, respectively:

SSC CGL TIER-II 29/01/2022

(a) 2688 and 7680
(b) 2624 and 7040
(c) 2560 and 6400
(d) 2560 and 7680

610. The base of right prism is a trapezium whose parallel sides are 11cm and 15cm and the distance between them is 9 cm. If the volume of the prism is 1731.6 cm³, then the height (in cm) of the prism will be :

SSC CGL TIER-II 11/09/2019

(a) 15.6
(b) 15.2
(c) 14.8
(d) 14.2

611. The base of a right prism is a regular hexagon of side 5 cm. If its height is $12\sqrt{3}$ cm, then its volume (in cm³) is:

SSC CGL TIER-II 15/11/2020

(a) 900
(b) 1800
(c) 1350
(d) 675

612. The base of a right prism is a triangle with sides 20 cm, 21 cm and 29 cm. If its volume is 7560 cm³, then its lateral surface area (in cm²) is :

SSC CGL TIER-II 12/09/2019

(a) 2484
(b) 2556
(c) 2520
(d) 2448

• TYPE – XVII •
PYRAMID

613. The base of a right pyramid is an equilateral triangle with area $16\sqrt{3}$ cm². If the area of one of its lateral faces is 30 cm², then its height (in cm) is:

SSC CGL TIER-II 13/09/2019

(a) $\sqrt{\frac{739}{12}}$
(b) $\sqrt{\frac{209}{12}}$
(c) $\sqrt{\frac{611}{12}}$
(d) $\sqrt{\frac{643}{12}}$

614. The base of right pyramid is an equilateral triangle, each side of which is 20 cm. Each slant edge is 30 cm. The vertical height (in cm) of the pyramid is:

SSC CGL TIER-II 29/01/2022

(a) $5\sqrt{3}$
(b) $10\sqrt{3}$
(c) $5\sqrt{\frac{23}{3}}$
(d) $10\sqrt{\frac{23}{3}}$

615. What is the total surface area of a pyramid whose base is a square with side 8 cm and height of the pyramid is 3 cm?

SSC CGL TIER-II 03/03/2023

(a) 169 cm²
(b) 121 cm²
(c) 144 cm²
(d) 184 cm²

616. The base of a pyramid is a regular polygon, whose total surface area is 340 cm², and area of base is 100 cm², if area of each lateral surface is 30 cm², then find no. of lateral surfaces of pyramid?

(a) 8
(b) 9
(c) 7
(d) 10

617. The base of a pyramid is an equilateral triangle whose each side is 8 cm. Its slant edge is 24 cm. What is the total surface area (in cm²) of the pyramid?

SSC CGL TIER- II 06/03/2023

(a) $\left(24\sqrt{3}+36\sqrt{35}\right)$
(b) $\left(16\sqrt{3}+48\sqrt{35}\right)$
(c) $\left(24\sqrt{3}+24\sqrt{35}\right)$
(d) $\left(12\sqrt{3}+24\sqrt{35}\right)$

618. The total surface area of a right pyramid, with base as a square of side 8 cm, is 208 cm². What is the slant height (in cm) of the pyramid?

SSC CGL 20/04/2022 (Shift-02)

(a) 7
(b) 9
(c) 10
(d) 8

619. The base of a right pyramid is a square of side $8\sqrt{2}$ cm and each of its slant edge is of length 10 cm. What is the volume (in cm³) of the pyramid?

SSC CGL TIER-II 03/02/2022

(a) 256
(b) 224
(c) $426\frac{2}{3}$
(d) $96\sqrt{2}$

620. The volume of a right pyramid is $45\sqrt{3}$ and its base is an equilateral triangle with side 6 cm. What is the height (in cm) of the pyramid ?

SSC CGL TIER-II 11/09/2019

(a) 15
(b) 18
(c) 12
(d) 20

621. A prism and a pyramid have the same base and the same height. Find the ratio of the volumes of the prism and the pyramid.

SSC CGL TIER-II 07/03/2023

(a) 2 : 3
(b) 3 : 1
(c) 1 : 3
(d) 3 : 2

622. A right square pyramid having lateral surface area is 624 cm^2. If the length of the diagonal of the square is $24\sqrt{2}$ cm, then the volume of the pyramid is:

SSC CPO 05/10/2023 (Shift-01)

(a) 780 cm^3
(b) 1150 cm^3
(c) 1083 cm^3
(d) 960 cm^3

SELECTION मंत्र #08

"Techniques for effective study ?"

#Hacks:-

☞ **Pomodoro Technique (Study in Intervals):**
- Study for 50 minutes, then take a 10-minute break.
- After 4-cycle you can take a long break (1 - 2 hours)
- Helps maintain focus and avoid burnout.

☞ **Smart Note-Taking:**
- Use mind maps, short summaries, and diagrams instead of long notes.
- Keep formula book (BRAHMASTRA) for quick revision.

☞ **Health & Mindset Matter:**
- Proper sleep (6-8 hrs), healthy diet, and short exercise sessions improve concentration.
- Stay motivated by setting small study goals & rewarding yourself.

Tip: Consistency, Smart Work & Strategic Revision = Success

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ADITYA RANJAN SIR

Chapter - 26 : Mensuration 2D & 3D

ANSWER KEY

1.	(d)	2.	(b)	3.	(b)	4.	(b)	5.	(c)	6.	(d)	7.	(a)	8.	(c)	9.	(c)	10.	(d)
11.	(c)	12.	(a)	13.	(d)	14.	(d)	15.	(c)	16.	(d)	17.	(d)	18.	(b)	19.	(d)	20.	(d)
21.	(c)	22.	(d)	23.	(d)	24.	(a)	25.	(d)	26.	(a)	27.	(b)	28.	(c)	29.	(c)	30.	(c)
31.	(a)	32.	(d)	33.	(b)	34.	(d)	35.	(c)	36.	(b)	37.	(c)	38.	(a)	39.	(b)	40.	(d)
41.	(c)	42.	(a)	43.	(c)	44.	(c)	45.	(d)	46.	(d)	47.	(a)	48.	(c)	49.	(d)	50.	(b)
51.	(d)	52.	(d)	53.	(d)	54.	(b)	55.	(c)	56.	(b)	57.	(a)	58.	(c)	59.	(a)	60.	(d)
61.	(d)	62.	(a)	63.	(c)	64.	(a)	65.	(d)	66.	(c)	67.	(d)	68.	(b)	69.	(c)	70.	(d)
71.	(a)	72.	(d)	73.	(d)	74.	(c)	75.	(d)	76.	(c)	77.	(b)	78.	(b)	79.	(a)	80.	(a)
81.	(a)	82.	(a)	83.	(c)	84.	(c)	85.	(b)	86.	(d)	87.	(c)	88.	(d)	89.	(d)	90.	(a)
91.	(a)	92.	(d)	93.	(b)	94.	(c)	95.	(b)	96.	(d)	97.	(c)	98.	(c)	99.	(a)	100.	(a)
101.	(b)	102.	(c)	103.	(c)	104.	(b)	105.	(c)	106.	(c)	107.	(a)	108.	(c)	109.	(b)	110.	(c)
111.	(c)	112.	(a)	113.	(c)	114.	(a)	115.	(b)	116.	(d)	117.	(c)	118.	(d)	119.	(d)	120.	(b)
121.	(d)	122.	(d)	123.	(c)	124.	(c)	125.	(a)	126.	(a)	127.	(b)	128.	(a)	129.	(b)	130.	(d)
131.	(b)	132.	(a)	133.	(d)	134.	(b)	135.	(c)	136.	(a)	137.	(a)	138.	(c)	139.	(d)	140.	(d)
141.	(b)	142.	(a)	143.	(b)	144.	(b)	145.	(a)	146.	(c)	147.	(c)	148.	(d)	149.	(a)	150.	(b)
151.	(d)	152.	(b)	153.	(b)	154.	(b)	155.	(c)	156.	(a)	157.	(d)	158.	(c)	159.	(c)	160.	(a)
161.	(b)	162.	(c)	163.	(a)	164.	(d)	165.	(c)	166.	(b)	167.	(c)	168.	(d)	169.	(d)	170.	(a)
171.	(d)	172.	(d)	173.	(d)	174.	(c)	175.	(a)	176.	(b)	177.	(a)	178.	(d)	179.	(c)	180.	(d)
181.	(b)	182.	(a)	183.	(c)	184.	(c)	185.	(a)	186.	(b)	187.	(c)	188.	(b)	189.	(d)	190.	(c)
191.	(d)	192.	(b)	193.	(d)	194.	(a)	195.	(a)	196.	(d)	197.	(a)	198.	(c)	199.	(b)	200.	(c)
201.	(d)	202.	(a)	203.	(a)	204.	(d)	205.	(d)	206.	(b)	207.	(c)	208.	(b)	209.	(b)	210.	(c)
211.	(d)	212.	(d)	213.	(d)	214.	(d)	215.	(a)	216.	(c)	217.	(d)	218.	(b)	219.	(c)	220.	(b)
221.	(d)	222.	(a)	223.	(b)	224.	(b)	225.	(d)	226.	(a)	227.	(c)	228.	(a)	229.	(b)	230.	(a)
231.	(b)	232.	(c)	233.	(b)	234.	(a)	235.	(d)	236.	(c)	237.	(c)	238.	(a)	239.	(b)	240.	(a)
241.	(b)	242.	(a)	243.	(c)	244.	(d)	245.	(c)	246.	(c)	247.	(b)	248.	(d)	249.	(d)	250.	(a)
251.	(c)	252.	(d)	253.	(d)	254.	(a)	255.	(b)	256.	(d)	257.	(a)	258.	(a)	259.	(b)	260.	(c)
261.	(b)	262.	(b)	263.	(d)	264.	(d)	265.	(b)	266.	(a)	267.	(b)	268.	(c)	269.	(c)	270.	(d)
271.	(a)	272.	(b)	273.	(b)	274.	(b)	275.	(d)	276.	(c)	277.	(d)	278.	(a)	279.	(b)	280.	(c)
281.	(b)	282.	(b)	283.	(a)	284.	(b)	285.	(c)	286.	(d)	287.	(b)	288.	(b)	289.	(c)	290.	(a)
291.	(a)	292.	(d)	293.	(a)	294.	(b)	295.	(d)	296.	(c)	297.	(c)	298.	(d)	299.	(b)	300.	(c)
301.	(b)	302.	(b)	303.	(b)	304.	(a)	305.	(d)	306.	(c)	307.	(b)	308.	(d)	309.	(c)	310.	(d)
311.	(c)	312.	(b)	313.	(a)	314.	(b)	315.	(c)	316.	(d)	317.	(d)	318.	(c)	319.	(d)	320.	(b)
321.	(b)	322.	(b)	323.	(a)	324.	(c)	325.	(a)	326.	(a)	327.	(c)	328.	(a)	329.	(c)	330.	(c)
331.	(c)	332.	(c)	333.	(c)	334.	(c)	335.	(d)	336.	(a)	337.	(a)	338.	(b)	339.	(c)	340.	(c)
341.	(d)	342.	(d)	343.	(a)	344.	(b)	345.	(c)	346.	(a)	347.	(c)	348.	(a)	349.	(c)	350.	(d)
351.	(a)	352.	(d)	353.	(c)	354.	(d)	355.	(c)	356.	(d)	357.	(d)	358.	(d)	359.	(c)	360.	(d)
361.	(d)	362.	(a)	363.	(d)	364.	(b)	365.	(d)	366.	(d)	367.	(b)	368.	(b)	369.	(d)	370.	(c)
371.	(d)	372.	(d)	373.	(b)	374.	(c)	375.	(d)	376.	(b)	377.	(b)	378.	(a)	379.	(b)	380.	(c)
381.	(b)	382.	(c)	383.	(b)	384.	(a)	385.	(c)	386.	(c)	387.	(c)	388.	(d)	389.	(a)	390.	(d)
391.	(b)	392.	(b)	393.	(a)	394.	(c)	395.	(d)	396.	(b)	397.	(d)	398.	(a)	399.	(a)	400.	(b)
401.	(b)	402.	(b)	403.	(b)	404.	(c)	405.	(d)	406.	(a)	407.	(a)	408.	(b)	409.	(b)	410.	(d)
411.	(a)	412.	(d)	413.	(b)	414.	(c)	415.	(b)	416.	(a)	417.	(a)	418.	(d)	419.	(c)	420.	(d)
421.	(a)	422.	(d)	423.	(a)	424.	(c)	425.	(b)	426.	(d)	427.	(d)	428.	(b)	429.	(c)	430.	(a)
431.	(c)	432.	(a)	433.	(b)	434.	(a)	435.	(a)	436.	(d)	437.	(b)	438.	(d)	439.	(b)	440.	(b)
441.	(c)	442.	(a)	443.	(c)	444.	(a)	445.	(d)	446.	(a)	447.	(a)	448.	(c)	449.	(a)	450.	(d)
451.	(c)	452.	(c)	453.	(c)	454.	(b)	455.	(c)	456.	(a)	457.	(c)	458.	(a)	459.	(c)	460.	(d)

Chapter - 26 : Mensuration 2D & 3D

461.	(b)	462.	(c)	463.	(d)	464.	(d)	465.	(c)	466.	(c)	467.	(a)	468.	(b)	469.	(b)	470.	(b)
471.	(b)	472.	(c)	473.	(c)	474.	(b)	475.	(d)	476.	(c)	477.	(c)	478.	(a)	479.	(d)	480.	(a)
481.	(c)	482.	(a)	483.	(a)	484.	(b)	485.	(a)	486.	(a)	487.	(a)	488.	(d)	489.	(d)	490.	(d)
491.	(a)	492.	(b)	493.	(d)	494.	(c)	495.	(c)	496.	(d)	497.	(a)	498.	(c)	499.	(a)	500.	(d)
501.	(d)	502.	(c)	503.	(a)	504.	(a)	505.	(b)	506.	(d)	507.	(d)	508.	(c)	509.	(c)	510.	(a)
511.	(d)	512.	(a)	513.	(a)	514.	(d)	515.	(a)	516.	(a)	517.	(c)	518.	(d)	519.	(c)	520.	(b)
521.	(b)	522.	(d)	523.	(a)	524.	(a)	525.	(a)	526.	(b)	527.	(c)	528.	(b)	529.	(b)	530.	(c)
531.	(a)	532.	(b)	533.	(d)	534.	(a)	535.	(d)	536.	(d)	537.	(c)	538.	(b)	539.	(b)	540.	(b)
541.	(b)	542.	(c)	543.	(a)	544.	(c)	545.	(d)	546.	(c)	547.	(c)	548.	(c)	549.	(d)	550.	(a)
551.	(d)	552.	(b)	553.	(c)	554.	(b)	555.	(d)	556.	(a)	557.	(a)	558.	(c)	559.	(b)	560.	(b)
561.	(a)	562.	(b)	563.	(d)	564.	(c)	565.	(a)	566.	(a)	567.	(d)	568.	(c)	569.	(d)	570.	(c)
571.	(b)	572.	(d)	573.	(b)	574.	(c)	575.	(b)	576.	(d)	577.	(c)	578.	(c)	579.	(a)	580.	(d)
581.	(a)	582.	(b)	583.	(d)	584.	(a)	585.	(a)	586.	(c)	587.	(b)	588.	(a)	589.	(c)	590.	(c)
591.	(c)	592.	(d)	593.	(a)	594.	(a)	595.	(a)	596.	(c)	597.	(a)	598.	(c)	599.	(c)	600.	(c)
601.	(b)	602.	(d)	603.	(b)	604.	(b)	605.	(d)	606.	(d)	607.	(d)	608.	(b)	609.	(d)	610.	(c)
611.	(c)	612.	(c)	613.	(c)	614.	(d)	615.	(c)	616.	(a)	617.	(b)	618.	(b)	619.	(a)	620.	(a)
621.	(b)	622.	(d)																

SOLUTIONS

1. (d) $3a = 36$

$\Rightarrow a = 12$

Area of equilateral $\Delta = \frac{\sqrt{3}}{4}a^2$

$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}$ unit²

2. (b) Side of equilateral triangle = 8 cm
Area of equilateral triangle

$= \frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4} \times 8 \times 8 = 16\sqrt{3}$

$= 16 \times 1.732 = 27.712\ \text{cm}^2 \sim 27.71\ \text{cm}^2$

3. (b) If perimeter is given and you have to find the maximum area triangle then you have to find the area of the equilateral triangle.
Area of equilateral triangle

$= \frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}$ unit²

4. (b) Perimeter of equilateral triangle

$= 3 \times \left(\sqrt[4]{\frac{16}{3}}\right)$

ATQ, $3 \times \text{Side} = 3 \times \left(\sqrt[4]{\frac{16}{3}}\right)$

$\Rightarrow \text{Side} = \frac{2}{\sqrt[4]{3}}$

$\therefore \text{Area} = \frac{\sqrt{3}}{4}\left(\frac{2}{\sqrt[4]{3}}\right)^2 = \frac{\sqrt{3}}{4} \times \frac{2^2}{(3^{\frac{1}{4}})^2} = 1$

5. (c) Area of equilateral triangle

$= \frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4} \times 22 \times 22 = 121\sqrt{3}\ \text{cm}^2$

6. (d) Area of an equilateral triangle

$= \frac{\sqrt{3}}{4}(\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}\ \text{cm}^2$

7. (a) Height of equilateral $\Delta = \frac{\sqrt{3}}{2}a$

$\Rightarrow 3\sqrt{3} = \frac{\sqrt{3}}{2}a$

$\Rightarrow a = 6$

$\therefore$ Area of equilateral $\Delta = \frac{\sqrt{3}}{4}a^2$

$= \frac{\sqrt{3}}{4} \times 36$

$= 9\sqrt{3}\ \text{cm}^2$

Alternate Method:

$\therefore$ Area of equilateral $\Delta = \frac{h^2}{\sqrt{3}} = \frac{(3\sqrt{3})^2}{\sqrt{3}}$

$= \frac{27}{\sqrt{3}} = 9\sqrt{3}\ \text{cm}^2$

8. (c) Median of equilateral triangle

$= \frac{\sqrt{3}}{2}a$

$\Rightarrow \frac{\sqrt{3}}{2}a = 6\sqrt{3}$

$\Rightarrow a = 12$ cm

Area of equilateral triangle $= \frac{\sqrt{3}}{4}a^2$

$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}\ \text{cm}^2$

Alternate Method:

Area of an equilateral triangle $= \frac{h^2}{\sqrt{3}}$

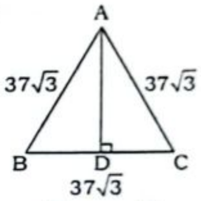
$= \frac{6\sqrt{3} \times 6\sqrt{3}}{\sqrt{3}}$

$= 36\sqrt{3}\ \text{cm}^2$

9. (c) Median of equilateral triangle $= \frac{\sqrt{3}}{2}a$

$\Rightarrow \frac{\sqrt{3}}{2}a = 15\sqrt{3} \Rightarrow a = 30$ cm

10. (d)



$AD = \frac{\sqrt{3}}{2}a = \frac{\sqrt{3}}{2} \times 37\sqrt{3}$

$= \frac{37 \times 3}{2} = 55.5$ cm

11. (c) $\text{Side} = \frac{2}{\sqrt{3}} \times \text{Height}$

$= \frac{2}{\sqrt{3}} \times 7\sqrt{3} = 14$ cm

Area of equilateral $\Delta = \frac{\sqrt{3}}{4}(\text{Side})^2$

$= \frac{\sqrt{3}}{4}(14)^2 = 49\sqrt{3}\ \text{cm}^2$

Alternate Method:

$\text{Area} = \frac{h^2}{\sqrt{3}} = \frac{(7\sqrt{3})^2}{\sqrt{3}} = 49\sqrt{3}\ \text{cm}^2$

12. (a) $\frac{\sqrt{3}}{4}a^2 = 289\sqrt{3}\ \text{cm}^2$

$\Rightarrow a^2 = 289 \times 4 \Rightarrow a^2 = \sqrt{289 \times 4}$

$\Rightarrow a = 17 \times 2 = 34$ cm

13. (d) Let side of equilateral triangle is 'a' cm

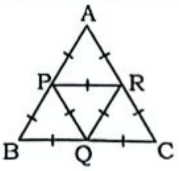
Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times a^2$

ATQ, $\frac{\sqrt{3}}{4}a^2 = 4\sqrt{3} \Rightarrow a = 4$ cm

14. (d) $\therefore$ Circumradius $= \frac{a}{\sqrt{3}}$

$= \frac{12}{\sqrt{3}} = 4\sqrt{3}$ cm

15. (c)



We know,

area of $\Delta PQR = \frac{1}{4} \times$ area of ΔABC

$= \frac{1}{4} \times \frac{\sqrt{3}}{4} \times 11^2 = \frac{121\sqrt{3}}{16}$

16. (d) $\because$ Area of a hexagon

$= 6 \times \frac{\sqrt{3}}{4} \times (\text{side})^2$

$\Rightarrow 6 \times \frac{\sqrt{3}}{4} \times a^2 = 1944\sqrt{3}$

$\Rightarrow a^2 = \frac{1944 \times 4}{6}$

$\Rightarrow a^2 = 324 \times 4 \Rightarrow a = 36$ m

Perimeter of the hexagon

$= 6 \times 36 = 216$ m

Total cost $= 216 \times 11.5 = 108 \times 23$

$= ₹2484$

17. (d) Let, $a = 10$ cm, $b = 12$ cm, $c = 18$ cm

Semi-Perimeter (s) $= \frac{a+b+c}{2}$

$= \frac{10+12+18}{2}$

$= 20$ cm

$\therefore$ Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{20(20-10)(20-12)(20-18)}$

$= \sqrt{20 \times 10 \times 8 \times 2} = 40\sqrt{2}\ \text{cm}^2$

18. (b) $s = \frac{3+5+6}{2} = 7$

By Heron's Formula:-

$A = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{7(7-3)(7-5)(7-6)}$

$= \sqrt{7 \times 4 \times 2 \times 1} = 2\sqrt{14}\ \text{cm}^2$

19. (d) Given,

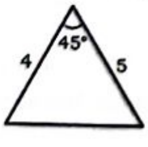
$a + b + c = 20$

$c = 20 - 5 - 6 = 9$

Area $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{10 \times 5 \times 4 \times 1} = 10\sqrt{2}$

20. (d)



Area $= \frac{1}{2} ab \sin\theta$

$= \frac{1}{2} \times 5 \times 4 \times \sin 45°$

$= 10 \times \frac{1}{\sqrt{2}} = 5\sqrt{2}\ \text{cm}^2$

21. (c) Given,

$s - a = 18$ cm

$s - b = 17$ cm

$s - c = 25$ cm

On adding

$\Rightarrow 3s - (a + b + c) = 60$

$\Rightarrow 3s - 2s = 60 \Rightarrow s = 60$

$\therefore$ Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{60 \times 18 \times 17 \times 25} = 30\sqrt{510}\ \text{cm}^2$

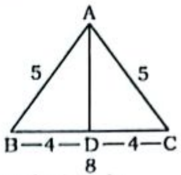
22. (d) Semi-perimeter $= \frac{100}{2} = 50$ cm

23. (d) One equal side = 28cm

Perimeter of isosceles triangle = 91

$\Rightarrow 28 + 28 + a = 91 \Rightarrow a = 35$ cm

24. (a)



AD → height of triangle

$AD \perp BC$

$\Rightarrow AD = \sqrt{5^2 - 4^2} = 3$

$\therefore$ Area of triangle $= \frac{1}{2} \times 8 \times 3 = 12\ \text{cm}^2$

25. (d) Let $a = b$,

$\sqrt{a^2 + b^2} = \sqrt{a^2 + a^2} = \sqrt{2}a$

$\sqrt{(2a)^2 + b^2} = \sqrt{4a^2 + a^2} = \sqrt{5}a$

$\sqrt{a^2 + (2b)^2} = \sqrt{a^2 + 4a^2} = \sqrt{5}a$

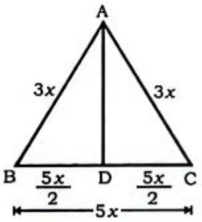
$\sqrt{2}a, \sqrt{5}a. \sqrt{5a} \Rightarrow$ isoscles Δ

Area of isosceles $\Delta = \frac{b}{4}\sqrt{4a^2 - b^2}$

$= \frac{\sqrt{2}a}{4}\sqrt{4(\sqrt{5}a)^2 - (\sqrt{2}a)^2}$

$= \frac{\sqrt{2}}{4} a \times 3\sqrt{2}a = \frac{3}{2}a^2 = \frac{3}{2}ab$

26. (a)



$AD = \sqrt{9x^2 - \frac{25x^2}{4}} = \sqrt{\frac{36x^2 - 25x^2}{4}}$

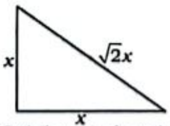
$= \frac{x\sqrt{11}}{2}$

ATQ, Area of Triangle $= 30\sqrt{11}\ \text{cm}^2$

$\Rightarrow \frac{1}{2} \times 5x \times \frac{x\sqrt{11}}{2} = 30\sqrt{11} \Rightarrow x = 2\sqrt{6}$

$\therefore BC = 5x = 5 \times 2\sqrt{6} = 10\sqrt{6}$ cm

27. (b)



Perimeter of right angle triangle

$= x + x + \sqrt{2}x$

$\Rightarrow 8(\sqrt{2} + 1) = 2x + \sqrt{2}x$

$\Rightarrow 8(\sqrt{2} + 1) = \sqrt{2}x(\sqrt{2} + 1)$

$x = 4\sqrt{2}$

$\therefore$ Hypotenuse of right angle triangle

$= \sqrt{2}x = \sqrt{2} \times 4\sqrt{2} = 8$ cm.

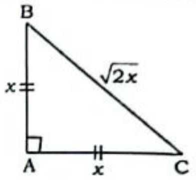
Alternate Method:

If perimeter of right angle isosceles triangle is $a(\sqrt{2} + 1)$ then, hypotenuse of triangle is a.

Here, perimeter $= 8(\sqrt{2} + 1)$

hypotenuse = 8.

28. (c)



Perimeter $= (2x + \sqrt{2x}) = x(2 + \sqrt{2})$

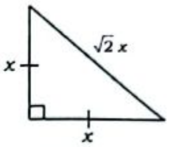
$\Rightarrow x(2 + \sqrt{2}) = 8(2 + \sqrt{2}) \Rightarrow x = 8$ cm

$\therefore$ Area of right angle triangle

$= \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 8 \times 8$

$= 32\ \text{cm}^2$

29. (c)



Area of right angle Δ

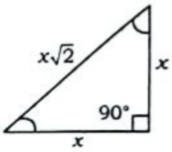
$= \frac{1}{2} \times \text{Base} \times \text{Perpendicular}$

$\Rightarrow 50 = \frac{1}{2} \times x \times x$

$\Rightarrow x = 10$ units

$\therefore$ Hypotenuse $= 10\sqrt{2}$ units

30. (c)



Perimeter $= x + x + x\sqrt{2}$

$\Rightarrow 2x + x\sqrt{2} = 30$

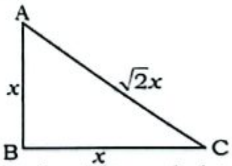
$\Rightarrow x = \frac{30}{2 + \sqrt{2}} = \frac{30 \times (2 - \sqrt{2})}{2}$

$= 15(2 - \sqrt{2})$

$\therefore$ Area of triangle $= \frac{1}{2} \times [15(2 - 1.41)]^2$

$= \frac{225 \times 0.59 \times 0.59}{2} \approx 39\ \text{m}^2$

31. (a)



Area of isosceles right angled triangle

$= \frac{1}{2} \times x \times x$

$\Rightarrow 200 = \frac{1}{2} \times x \times x$

$\Rightarrow x^2 = 400 \Rightarrow x = 20$

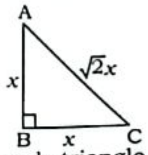
$AC = 20\sqrt{2}$ (by triplet 1, 1, $\sqrt{2}$)

$= 20 \times 1.414 = 28.28$

Perimeter of $\Delta = 28.28 + 40$

$= 68.28$ cm ~ 68.3cm

32. (d)



Area of right angle triangle

$= \frac{1}{2} \times x \times x$

$\Rightarrow 16 = \frac{1}{2}x^2 \Rightarrow x = 4\sqrt{2}$

$\therefore$ Hypotenuse $= \sqrt{2}x = \sqrt{2} \times 4\sqrt{2}$
$= 8$ m

33. (b) Area of triangle $= \frac{1}{2} \times$ base $\times$ height
$= \frac{1}{2} \times 7 \times 82 = 287$ cm^2

Note:- It can be done with the help of unit digit.

34. (d) Area of triangle $= \frac{1}{2} \times$ Base $\times$ Height

$\Rightarrow 18 = \frac{1}{2} \times 6 \times$ Height

$\Rightarrow$ Height $= 6$ cm.

35. (c) Triplet $\longrightarrow$ (6 8 10)
↓ ↓ ↓
B P H

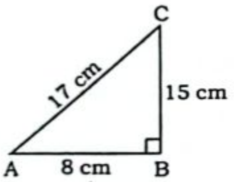
The given triplet shows that the triangle is right angled triangle.

$\therefore$ Area of triangle $= \frac{1}{2} \times$ base $\times$ height
$= \frac{1}{2} \times 6 \times 8 = 24$ cm^2

36. (b) Given sides are (5, 12, 13) are Triplet
Which are sides of the right angled triangle.

Area $= \frac{1}{2} \times$ base $\times$ height
$= \frac{1}{2} \times 12 \times 5 = 30$ cm^2

37. (c)



Area of triangle $= \frac{1}{2} \times 8 \times 15 = 60$ cm^2

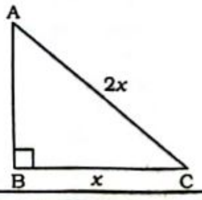
38. (a)
Sides(Right angle Δ)
5 12 13 → 30 unit $\xrightarrow{\times 3}$ 90 cm
$\downarrow \times 3$ $\downarrow \times 3$ $\downarrow \times 3$
15 cm 36 cm 39 cm

Area $= \frac{1}{2} \times$ base $\times$ height
$= \frac{1}{2} \times 15 \times 36 = 270$ cm^2

39. (b) Area $= \frac{1}{2} \times 3 \times 4 = 6$ unit^2
2 unit = 3.6
1 unit = 1.8
1 unit^2 = 3.24
6 unit^2 = $6 \times 3.24 = 19.44$ cm^2
$\therefore$ Area of triangle = 19.44 cm^2

40. (d) In right angle triangle ABC,

$AB = \sqrt{AC^2 - BC^2} = \sqrt{4x^2 - x^2} = \sqrt{3}x$

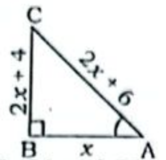


ATQ,

$\frac{1}{2} \times x \times \sqrt{3}x = 600$

$\Rightarrow \sqrt{3}x^2 = 1200 \Rightarrow x^2 = 400\sqrt{3}$
$\Rightarrow x^2 = 692.8 \Rightarrow x = 26.32$m
$\therefore$ Hypotenuse is 26.32m more than the base

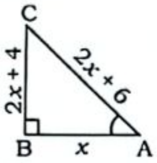
41. (c)



Triplet of 10, 24 and 26 satisfy the above condition.
So, Base = 10m, Perpendicular
= 24m, Hypotenuse = 26m

Area of triangle $= \frac{1}{2} \times$ Base $\times$ Perpendicular $= \frac{1}{2} \times 10 \times 24$
$= 120$ m^2

Alternate Method:



$\therefore h^2 = p^2 + b^2$
$(2x + 6)^2 = (2x + 4)^2 + x^2$
$\Rightarrow 4x^2 + 24x + 36 = 4x^2 + 16x + 16 + x^2$
$\Rightarrow x^2 - 8x - 20 = 0$
$\therefore x = 10$
So, b = 10, p = 24, h = 26

$\therefore$ Area of triangle $= \frac{1}{2} \times$ Base $\times$ Perpendicular $= \frac{1}{2} \times 10 \times 24$
$= 120$ m^2

42. (a) Base $= \frac{2}{3} \times$ height

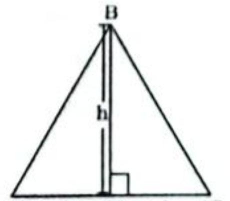
$\Rightarrow \frac{\text{Base}}{\text{Height}} = \frac{2}{3}$

Area of $\Delta = \frac{1}{2} \times$ Base $\times$ Height

$\Rightarrow 363 = \frac{1}{2} \times 2x \times 3x$
$\Rightarrow 3x^2 = 363 \Rightarrow x^2 = 121 \Rightarrow x = 11$
$\therefore$ Height $= 3 \times 11 = 33$ cm

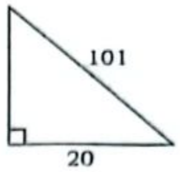
43. (c) We know that the area of a triangle formed by the mid points of sides of given triangle is $\frac{1}{4}$ of the given triangle
Hence, area of required Δ
$= \frac{1}{2} \times \frac{1}{4} \times 5 \times 12 = 7\frac{1}{2}$ cm^2

44. (c)



Area of ΔABC
$= \frac{1}{2} \times$ Base $\times$ Perpendicular
$= \frac{1}{2} \times (6 + 4) \times 12 = 60$ cm^2

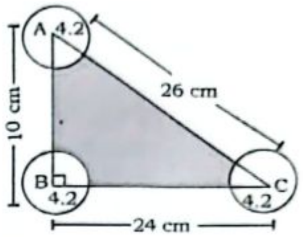
45. (d)



Third side $= \sqrt{(101)^2 - (20)^2}$
$= \sqrt{121 \times 81} = 11 \times 9 = 99$ cm

$\therefore$ Area $= \frac{1}{2} \times 99 \times 20 = 990$ cm^2

46. (d)

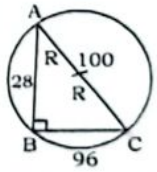


$\because$ ΔBAC is a right angle triangle–
$26^2 = 24^2 + 10^2$
radius of each circle = 4.2 cm

Total area of sectors $= \frac{180°}{360°}\pi r^2$
$= \frac{1}{2} \times \frac{22}{7} \times 4.2 \times 4.2$
$= 27.72$ cm^2

Area of ΔABC $= \frac{1}{2} \times BA \times AC$
$= \frac{1}{2} \times 24 \times 10 = 120$ cm^2
$\therefore$ Area of remaining region
$= 120 - 27.72$
$= 92.28$ cm^2

47. (a)



7, 24, 25
$\downarrow \times 4$ $\downarrow \times 4$ $\downarrow \times 4$
28 96 100

$AC = \sqrt{96^2 + 28^2} = 100$ cm

$R = \frac{AC}{2} = \frac{100}{2} = 50$ cm

$\therefore$ Area of circumcircle $= \pi R^2$
$= 3.14 \times 50 \times 50 = 7850$ cm^2

48. (c) Area of isosceles ΔABC
$= \frac{b}{2}\sqrt{a^2 - \frac{b^2}{4}} = \frac{10}{2}\sqrt{20^2 - \frac{10^2}{4}}$
$= 5\sqrt{375} = 25\sqrt{15}$
$= 25 \times 3.87 = 96.75$ cm^2

Area of right angle ΔPQR
$= \frac{1}{2} \times$ base $\times$ perpendicular
$= \frac{1}{2} \times 12 \times 5 = 30$ cm^2
$\therefore$ Difference $= 96.75 - 30$
$= 66.75$ cm^2

49. (d) $r = \frac{\Delta}{S} \Rightarrow \Delta = rs$

Perimeter = length of external boundaries = 125 cm

$s = \frac{125}{2}$ cm

$\therefore \Delta = \frac{8 \times 125}{2} = 500$

50. (b) Area of circle = πr^2

$\Rightarrow \pi r^2 = 154 \Rightarrow r^2 = \frac{154 \times 7}{22}$

$\Rightarrow r = 7$ m

Circumference = $2\pi r$

$= 2 \times \frac{22}{7} \times 7 = 44$ m

If r = 7
Then area = 154
circumference = 44

51. (d) Given,

$2\pi(r_1 - r_2) = 352 - 198$

$\Rightarrow 2\pi(r_1 - r_2) = 154$

$\Rightarrow (r_1 - r_2) = \frac{154 \times 7}{2 \times 22} = \frac{49}{2} = 24.5$

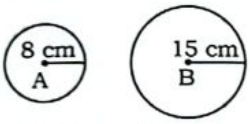
52. (d) Area of circle = πr^2

$\Rightarrow 1386 = \frac{22}{7} \times r^2$

$\Rightarrow r^2 = \frac{1386 \times 7}{22}$

$\Rightarrow r^2 = 441 \Rightarrow r = 21$cm

53. (d)



Area of circle = πr^2

Sum of area of circle = A + B

$= 64\pi + 225\pi = 289\pi$

Area of third circle $(\pi r^2) = 289\pi$

$\Rightarrow r = 17$ cm

$\therefore$ Perimeter of 3rd circle

$= 2\pi r = 2 \times \pi \times 17 = 34\pi$

54. (b) Let, radius of required circle = R

$R_1 = 12$ and $R_2 = 16$

ATQ,

$2\pi R = 2\pi R_1 + 2\pi R_2$

$\Rightarrow R = R_1 + R_2$

$\Rightarrow R = 12 + 16 = 28$

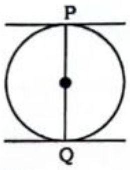
$\therefore$ Diameter of circle = 28 × 2 = 56 cm

55. (c) $\frac{\text{Circumference}}{\text{Diameter}} = \frac{3}{5} \xrightarrow{\times 2} \frac{6}{10}$

Diameter = 10 cm.

$\therefore$ Radius = $\frac{\text{Diameter}}{2} = \frac{10}{2} = 5$ cm.

56. (b)



PQ is diameter of circle

Area of circle = 154 cm²

$\Rightarrow \pi r^2 = 154$ cm²

$\Rightarrow r^2 = \frac{154 \times 7}{22} = 49$

$\Rightarrow r = 7$ cm

$\therefore$ Diameter = 2 × 7 = 14 cm.

Alternate Method:

We know that,

When radius = 7 unit then Area = 154 unit

154 unit → 154

1 unit → 1

Radius = $7 \times (1)^2 = 7$

$\therefore$ Diameter = 2 × 7 = 14 cm.

57. (a) $2\pi r = 264 \Rightarrow r = 42$

$2\pi R = 308 \Rightarrow R = 49$

Difference b/w the area of largest and smallest circle = $\pi(49^2 - 42^2)$

$= \pi[(49 + 42) \times (49 - 42)]$

$= \pi(91 \times 7)$

$= \frac{22}{7} \times 91 \times 7 = 2002$

Note:- It can be solved with the help of unit digit only option (a) satisfy.

58. (c) $2\pi r = 880 \Rightarrow r = 20 \times 7 = 140$ m

$2\pi R = 1012 \Rightarrow R = 23 \times 7 = 161$ m

Area of track = $\frac{22}{7} \times (161^2 - 140^2)$

$= \frac{22}{7} \times 301 \times 21 = 19866$ m²

Note:- Do it with the help of unit digit. Only option (c) satisfy.

59. (a) Area = 81 : 121

Circumference = $\sqrt{81} : \sqrt{121} = 9 : 11$

60. (d) Rate of building a fence per foot = 13·50

Total cost of building fence = 7425

Perimeter or circumference

$= \frac{\text{Total cost}}{\text{Cost per feet}} = \frac{7425}{1350} \times 100 = 550$

$\Rightarrow 2\pi r = 550$

$\Rightarrow 2 \times \frac{22}{7} \times r = 550 \quad \Rightarrow r = 87.5$

$\therefore$ Area of field

$= \frac{22}{7} \times 87.5 \times 87.5 = 24062.5$ ft²

61. (d) Given, difference between areas

$= 88$ cm² $\Rightarrow \pi(r_1^2 - r_2^2) = 88$

$\Rightarrow \frac{22}{7}(r_1^2 - r_2^2) = 88 \Rightarrow (r_1^2 - r_2^2) = 28$

$\Rightarrow (r_1^2 - 36) = 28 \Rightarrow r_1^2 = 64 \Rightarrow r_1 = 8$

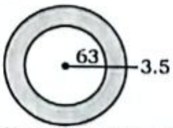
$\therefore$ Area of larger circle = $\frac{22}{7} \times 8 \times 8$

$= \frac{1408}{7} \sim 201$ cm²

62. (a) $\pi r^2 = 12474$

$\Rightarrow r^2 = 12474 \times \frac{7}{22} = 81 \times 49$

$\Rightarrow r = 63$



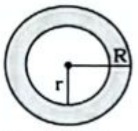
New radius (R) = 63 + 3.5 = 66.5

Area of path = $\pi R^2 - \pi r^2$

$= \frac{22}{7} \times 66.5 \times 66.5 - 12474$

$= 13898.5 - 12474 = 1424.5$ m²

63. (c) Given,



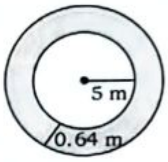
$\pi(R^2 - r^2) = 3080$

$\Rightarrow \pi(R + r)(R - r) = 3080$

$\Rightarrow 10\pi(R + r) = 3080$

$\Rightarrow (R + r) = \frac{308}{22} \times 7 = 14 \times 7 = 98$ m

64. (a)



r = 5 m

Area of path = $\pi(5.64^2 - 5^2)$

$= \frac{22}{7} \times 10.64 \times 0.64$

$= 22 \times 1.52 \times 0.64$

$= 21.4016 \sim 21$ m²

$\therefore$ Area of path = 21 m²

65. (d) Given,

$2\pi R = 506$

$\Rightarrow R = \frac{506}{2\pi} = \frac{23 \times 7}{2}$ cm = 80.5 m

and $2\pi r = 440$

$\Rightarrow r = \frac{440}{2\pi} = 70$ m

Area of path = $\pi[80.5^2 - 70^2]$

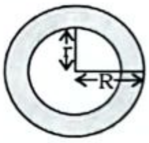
$= \pi \times 150.5 \times 10.5$

$= 4966.5$

Total cost = 4966.5 × 6 = ₹29799

Note:- It can be done with the help of unit digit. Only option d satisfied).

66. (c) Let, outer radius and inner radius be R and r respectively.



R – r = 10 m

$\pi(R^2 - r^2) = 3080$

$\Rightarrow \frac{22}{7} \times (R + r)(R - r) = 3080$

$\Rightarrow \frac{22}{7} \times 10 \times (R + r) = 3080$

$\Rightarrow R + r = \frac{3080 \times 7}{220} \Rightarrow R + r = 98$

67. (d) R + r = 286 cm ......(i)

ATQ,

$\pi(R^2 - r^2) = 50336$

$\Rightarrow \frac{22}{7} \times (R + r)(R - r) = 50336$

$\Rightarrow \frac{22}{7} \times 286 \times (R - r) = 50336$

$\Rightarrow R - r = \frac{50336 \times 7}{22 \times 286}$

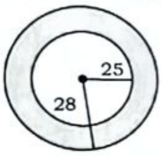
$\Rightarrow R - r = 56$ cm ......(ii)

From (i) and (ii)

2R = 286 + 56

$\Rightarrow R = 171$ cm and r = 286 – 171 = 115 cm

68. (b)



Area of path = $\pi(r_1^2 - r_2^2)$

$= \pi(28^2 - 25^2)$

$= \pi(784 - 625)$

$= \frac{22}{7} \times 159$

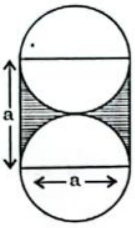
∴ Cost of levelling the track

$= \frac{22}{7} \times 159 \times 28$

= Rs.13992

Note:- It can be done with the help of unit digit.

69. (c)



∴ $r = \frac{a}{2}$

ATQ,

$a^2 - \pi\left(\frac{a}{2}\right)^2 = 42$

$\Rightarrow a^2 - \frac{22}{7} \times \left(\frac{a}{2}\right)^2 = 42$

$\Rightarrow \frac{28a^2 - 22a^2}{28} = 42$

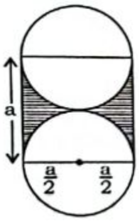
$\Rightarrow \frac{6a^2}{28} = 42$

$\Rightarrow a^2 = 7 \times 28 = 196$

$\Rightarrow a = 14$

∴ Diameter of each circle = 14 cm

Alternate Method:



ATQ,

$r = \frac{a}{2}$

Area of square : Area of circle

$a^2 : \frac{22}{7} \times \frac{a^2}{4}$

$\underbrace{14 : 11}_{\text{diff. } 3}$

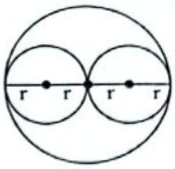
Area of remaining portion = 14 – 11
= 3 units

Area of square = $\frac{42}{3} \times 14 = 196$

Side of square = 14 cm

∴ Diameter of each circle = 14 cm

70. (d)



$2\pi R = 264$

$\Rightarrow 2 \times \frac{22}{7} \times R = 264$

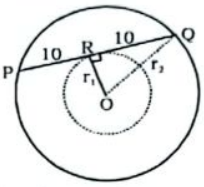
$\Rightarrow R = 42$ cm

∴ $r = \frac{42}{2} = 21$ cm

∴ Circumference of each plate = $2\pi r$

= 44 × 3 = 132 cm

71. (a)



Area of a circular portion

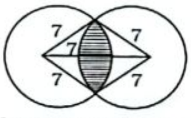
$= \pi\left(r_2^2 - r_1^2\right)$

From figure:-

$10^2 = r_2^2 - r_1^2$

∴ Required area = $\pi 10^2 = 100\pi$ cm²

72. (d)



Area of cross section = 2 × (Area of sector - Area of equilateral triangle)

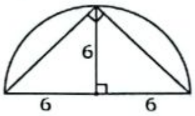
$= 2 \times \left(\frac{\theta}{360°} \times \pi r^2 - \frac{\sqrt{3}}{4}a^2\right)$

$= 2 \times \left(\frac{60°}{360°} \times \pi 7^2 - \frac{\sqrt{3}}{4}7^2\right)$

$= 2 \times 49\left(\frac{1}{6} \times \pi - \frac{\sqrt{3}}{4}\right)$

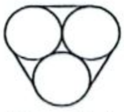
$= 98\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$ cm²

73. (d)



Area of triangle = $\frac{1}{2} \times 6 \times 12 = 36$ cm²

74. (c)

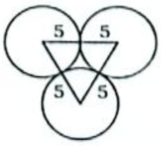


∴ Length of string = $2r(\pi + 3)$

$= 2 \times 7\ (\pi + 3)$

$= 14(\pi + 3) = 14\pi + 42$

75. (d)



Area subtended b/w them = Area of equilateral Δ – 3 × Area of sector

$= \frac{\sqrt{3}}{4} \times 10 \times 10 - 3 \times \frac{60°}{360°}\pi \times 25$

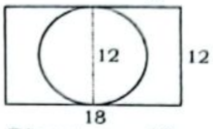
$= 25\sqrt{3} - \frac{25}{2}\pi = 25\left(\sqrt{3} - \frac{\pi}{2}\right)$

Alternate Method:-

Area of triangle which is not included in circles = $r^2\ (\sqrt{3} - \frac{\pi}{2})$

$= 25\ (\sqrt{3} - \frac{\pi}{2})$ cm²

76. (c)

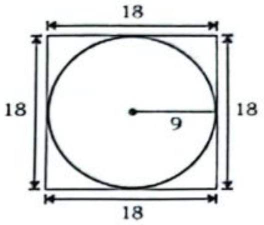


$\Rightarrow r = \frac{\text{Diameter}}{2} = \frac{12}{2} = 6$

∴ Area of circle = $\pi r^2 = \pi(6)^2$

$= 36\pi$cm²

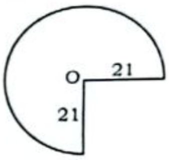
77. (b)



r = 9cm

Area = $\pi r^2 = \pi \times r^2 = 81\pi$

78. (b)



∵ Circumference of circle = $2\pi r$

∴ Perimeter of remaining pizza

$= 2\pi r \times \frac{3}{4} + 2r$

$= 2r\left(\frac{3}{4}\pi + 1\right)$

$= 2 \times 21\left(\frac{3}{4} \times \frac{22}{7} + 1\right)$

$= 42 \times \frac{47}{14} = 141$ cm

79. (a) Area of square (a^2) = 30.25

Side of Square (a) = 5.5 cm

Perimeter of square = 4×5.5 = 22 cm

Circumference of circle = $2\pi r$

$\Rightarrow 22 = 2\pi r \Rightarrow r = \frac{7}{2}$cm

Area of circle = πr^2

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2} = 38.5$ cm²

80. (a) Given,

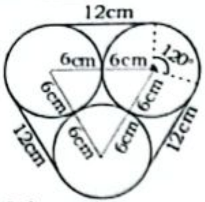
$a^2 = 5929$ cm² and $2\pi R = 4a$

$\Rightarrow R = \frac{4a}{2\pi} = \frac{2a}{\pi}$

Area = $\pi R^2 = \pi \times \frac{2a}{\pi} \times \frac{2a}{\pi} = \frac{4a^2}{\pi}$

$= \frac{4 \times 5929 \times 7}{22} = 7546$ cm²

81. (a)



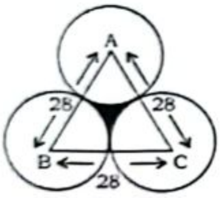
Length of the string
$= 3 \times 12 + 3 \times$ Length of arc of 120°
$= 3 \times 12 + 3 \times \frac{120°}{360°} \times 2\pi R$
$= (36 + 12\pi)$ cm

Alternate Method:
Length of string $= 2\pi r + 2nr$
Where, n is no. of circle
$= (12\pi + 36)$ cm

82. (a) Let radius of smaller circle = R
Then radius of bigger circle = 2R
Given, $\pi R^2 = 192$
Then,
$\pi \times (2R)^2 = 4\pi R^2 = 4 \times 192 = 768\ cm^2$

83. (c) Area of triangular park
$= \frac{1}{2} \times 160 \times 300 = 24000\ m^2$
ATQ,
$\Rightarrow 24000 = \frac{105}{22} \times \pi R^2$
$\Rightarrow R^2 = \frac{24000 \times 22 \times 7}{105 \times 22}$
$\Rightarrow R^2 = 1600 \Rightarrow R = 40$
Perimeter of circular park $= 2\pi R$
$= 2 \times \frac{22}{7} \times 40 = \frac{1760}{7} = 251.4$ m

84. (c)



Area of triangle which is not included in circles = Area of equilateral Δ − 3 × Area of sector
$= \frac{\sqrt{3}}{4} a^2 - 3 \times \frac{\theta}{360°} \times \pi r^2$
$= \frac{\sqrt{3}}{4} \times 28 \times 28 - 3 \times \frac{60°}{360°} \times \frac{22}{7} \times 14 \times 14$
$= 1.73 \times 28 \times 7 - 22 \times 14$
$= 14(14 \times 1.73 - 22)$
$= 14 \times 2.22 = 31.08\ cm^2$

Alternate Method:-
Area of triangle which is not included in circles $= r^2 \left(\sqrt{3} - \frac{\pi}{2}\right)$
$= 196 \left(1.73 - \frac{22}{14}\right)$
$= 14 \times 2.22 = 31.08\ cm^2$

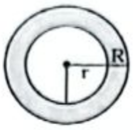
85. (b) Semi-Perimeter (s) $= \frac{a + b + c}{2}$
$= \frac{35 + 53 + 66}{2} = 77$
By Heron's Formula:-
Area of $\Delta = \sqrt{s(s - a)(s - b)(s - c)}$
$= \sqrt{77(42)(24)(11)}$
$= 11 \times 7 \times 12$
$= 924$

Given that,
$\pi r^2 = 924 \times 6$
$\Rightarrow r^2 = \frac{924 \times 7 \times 6}{22} \Rightarrow r = 42$ m

86. (d)

Given,
$\frac{2\pi R}{2\pi r} = \frac{17}{15} \Big) 2$ unit
Also, $R - r = 40$ m
Then, 2 units = 40
Inner radius (15 unit) = 300 m

87. (c)



ATQ,
$R - r = 50$
$\Rightarrow \frac{2\pi R}{2\pi r} = \frac{5}{4} \Rightarrow \frac{R}{r} = \frac{5}{4} \Big) 1$ unit
1 unit → 50 m
Internal radius(r), 4 unit → 200m

88. (d) $\frac{\text{Outer circumference}}{\text{Inner circumference}} = \frac{2\pi R}{2\pi r}$
$= \frac{7}{6}$

$$\Rightarrow \frac{R}{r} = \frac{7}{6} \Big) 1 \text{ unit} = 45$$
$$\Big\downarrow \times 45$$
$$270\text{m}$$

∴ Radius of inner circle = 270

89. (d) Distance covered by wheel in 380 revolutions $= 380 \times 2\pi r = 380 \times 2 \times \frac{22}{7} \times \frac{1.33}{2} = 1588.4 \sim 1588$

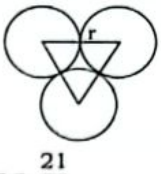
90. (a) Distance = 44 km
Distance covered by a wheel for 1 revolution $= 2\pi r$
$\Rightarrow$ So, $500 \times 2\pi r = 44$ km
$\Rightarrow 500 \times 2\pi r = 44 \times 1000$m
$\Rightarrow r = \frac{44 \times 1000 \times 7}{500 \times 2 \times 22}$
$\Rightarrow r = 14$m

91. (a) $2r = 42$ cm $\Rightarrow r = 21$ cm
A Wheel covered distance in one revolution $= 2\pi r$
A wheel covered total in 12 revolution
$= 12 \times 2\pi r$
$= 12 \times 2 \times \frac{22}{7} \times 21$
$= 24 \times 66 = 1584$ cm = 15.84 m

92. (d) 1 km → 0.2 cm
$1\ km^2 \rightarrow 0.04\ cm^2$
$22500\ km^2 \rightarrow 22500 \times 0.04$
$= 900\ cm^2$

93. (b) Perimeter of semicircle $= 2r + \pi r$
$\Rightarrow 56.54 = 2r + 3.14r$
$\Rightarrow 5.14r = 56.54$
$\Rightarrow r = 11$ cm
∴ Diameter of semicircle = 2r
$= 2 \times 11 = 22$ cm

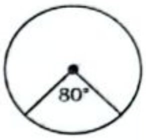
94. (c)



$d = 21,\ r = \frac{21}{2}$
Area of the space enclosed by a circle
$= r^2 \left(\sqrt{3} - \frac{\pi}{2}\right)$
$= \left(\frac{21}{2}\right)^2 \left(1.732 - \frac{3.141}{2}\right)$
$= \frac{441}{4} \times \frac{(3.464 - 3141)}{2} = \frac{441}{4} \times \frac{0.323}{2}$
$= 17.8 \sim 17.7\ cm^2$

95. (b) Length of arc
$= \frac{\text{Central angle made by arc}}{360°} \times 2\pi r$

96. (d)



Length of Arc $= \frac{80°}{360°} \times 2\pi r$
$\Rightarrow 96\pi = \frac{2}{9} \times 2\pi r$
$\Rightarrow r = 216$ units

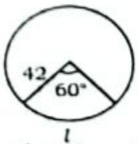
97. (c) Length of arc of a sector
$= \frac{\theta}{360°} \times 2\pi r$
$\Rightarrow 5.5 = \frac{30°}{360°} \times 2 \times \frac{22}{7} \times r$
$\Rightarrow r = \frac{21}{2} = 10.5$ cm
∴ Radius of circle = 10.5

98. (c) We know, Length of arc
$= \frac{\theta}{360°} \times \pi d$

99. (a) Arc length $= \frac{\theta}{360°} \times 2\pi r$
$\Rightarrow 23.1 = \frac{18°}{360°} \times 2 \times \frac{22}{7} \times r$
$\Rightarrow r = 73.5$
Area of circle $= \pi r^2$
$= \frac{22}{7} \times 73.5 \times 73.5 = 16978.5\ cm^2$

100. (a) Length of arc $= \frac{\theta}{360°} \times 2\pi r$
$= \frac{108°}{360°} \times 2 \times \frac{22}{7} \times \frac{7}{2}$
$= \frac{3}{10} \times 22 = \frac{66}{10} = 6.6$ cm

101. (b)



We know that, length of arc (l)
$= \frac{\theta}{360°} \times 2\pi r = \frac{60°}{360°} \times 2 \times \frac{22}{7} \times 42$
$= \frac{1}{6} \times 44 \times 6 = 44$ cm

102. (c) Length of arc $= \frac{\theta}{360°} \times 2\pi r$

$\Rightarrow \frac{2\pi r \times 18°}{360°} = 44$

$\Rightarrow r = \frac{44 \times 360° \times 7}{2 \times 22 \times 18°} = 140$ m

103. (c) Length of arc $= \frac{\theta}{360°} \times 2\pi r$

$\Rightarrow 19 = \frac{\theta}{360°} \times 2 \times \frac{22}{7} \times 30$

$\Rightarrow \theta = \frac{19 \times 360° \times 7}{2 \times 22 \times 30} \Rightarrow \theta = \frac{19 \times 21°}{11}$

$\Rightarrow \theta = \frac{399°}{11} = 36.27°$

104. (b) Area of sector $= \frac{\theta}{360°} \times \pi r^2$

ATQ,

$\frac{45°}{360°} \times \pi r^2 = 88 \Rightarrow r^2 = \frac{88 \times 8 \times 7}{22}$

$\therefore\ r = 4\sqrt{14}$ cm

105. (c) Area of sector $= \frac{\theta}{360°} \pi r^2$

$\Rightarrow 88 = \frac{22}{7} r^2 \times \frac{36°}{360°}$

$\Rightarrow r^2 = 4 \times 7 \times 10$

$\Rightarrow r = 2\sqrt{70}$ cm

106. (c) Area $= \frac{\theta}{360°} \pi r^2$

$\Rightarrow 346.5 = \frac{22.5°}{360°} \times \frac{22}{7} \times r^2$

$\Rightarrow r^2 = \frac{346.5 \times 7 \times 360°}{22 \times \frac{45°}{2}}$

$\Rightarrow r^2 = 31.5 \times 7 \times 8 = \frac{63}{2} \times 7 \times 8$

$\Rightarrow r^2 = 7 \times 9 \times 7 \times 4$

$\Rightarrow r = 7 \times 3 \times 2 = 42$ cm

107. (a) ATQ,

$\pi r^2 \frac{\theta}{360°} = 32\pi$

$\Rightarrow \frac{\theta}{360°} = \frac{32}{144} \Rightarrow \theta = 80°$

$l = \frac{80°}{360°} \times 2\pi \times 12 = \frac{16}{3}\pi$ cm

108. (c) Area of sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{30°}{360°} \times \frac{22}{7} \times 4 \times 4$

$= \frac{88}{21} = 4.186$ cm²

109. (b) Length of arc = 11 cm, radius = 15.75 cm

Area of sector $= \frac{1}{2} \times$ radius × length of arc

$= \frac{1}{2} \times 15.75 \times 11 = 15.75 \times 5.5$

$= 86.625$ cm²

110. (c) Length of arc $= \frac{\theta}{360} \times 2\pi r$

$\Rightarrow 44 = \frac{30°}{360°} \times 2 \times \frac{22}{7} \times r$

$\Rightarrow r = 84$ cm.

Then,

$\therefore$ Area of Sector $= \frac{\theta}{360} \times \pi r^2$

$= \frac{30°}{360°} \times \frac{22}{7} \times 84 \times 84 = 1848$ cm²

111. (c) Area of sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{45°}{360°} \times 3.14 \times 4 \times 4 = 6.28$ cm²

112. (a) Area of sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{60°}{360°} \times \frac{22}{7} \times 21 \times 21 = 11 \times 21$

$= 231$ cm²

Note:- It can be done with the help of unit digit.

113. (c) Area of sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{72°}{360°} \times \frac{22}{7} \times 35 \times 35 = 770$

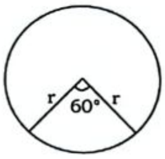
Note:- Check multiple of 11 and 7.

114. (a) Area of sector $= \frac{\theta}{360°} \pi r^2$

$= \frac{60°}{360°} \times 3.14 \times 100$

$= \frac{314}{6} = 52.33$ cm²

115. (b)



Perimeter of sector $= \frac{\theta}{360°} 2\pi r + 2r$

$\Rightarrow \frac{64}{3} = \frac{60°}{360°} \times 2 \times \frac{22}{7} r + 2r$

$\Rightarrow \frac{64}{3} = \frac{22}{21} r + 2r$

$\Rightarrow \frac{64}{3} = \frac{64r}{21} \Rightarrow r = 7$

$\therefore$ Area of sector $= \frac{\theta}{360°} \pi r^2$

$= \frac{60°}{360°} \times \frac{22}{7} \times 7 \times 7 = \frac{77}{3}$ cm²

116. (d) Area of Sector $= \frac{\theta}{360°} \times \pi r^2$

$\Rightarrow 16\pi = \frac{\theta}{360°} \times \pi \times 8^2$

$\Rightarrow \frac{\theta}{360°} \times 4 = 1$

$\Rightarrow \theta = 90°$

117. (c) Area of sector of a circle

$= \frac{\theta}{360°} \times \pi r^2$

$\Rightarrow 462 = \frac{120°}{360°} \times \frac{22}{7} \times r^2$

$\Rightarrow 462 = \frac{22}{21} r^2$

$\Rightarrow r^2 = 21 \times 21$

$\Rightarrow r = 21$ cm.

118. (d) Area of sector $= \frac{\theta}{360°} \times \pi r^2$

$\Rightarrow \frac{\theta}{360°} \times \frac{22}{7} \times 14 \times 14 = 231$

$\Rightarrow \theta = \frac{231 \times 360}{28 \times 22} = 135°$

119. (d) Perimeter of sector $= \frac{\theta}{360°} \times 2\pi r + 2r$

$= \frac{30°}{360°} \times 2\pi r + 2r = \frac{1}{6} \times \pi r + 2r$

$= \frac{1}{6} \times 3.14 \times 10 + 20$

$= \frac{31.4 + 120}{6} = \frac{151.4}{6} = 25.2$

120. (b) Perimeter of sector

$= 2r + \frac{\theta}{360°} \times 2\pi r$

$= 2 \times 12 + \frac{30°}{360°} \times 2 \times 3.14 \times 12$

$= 24 + 6.28 = 30.28$ cm.

121. (d) Perimeter of sector $= 2r + \frac{\theta}{360°} \times 2\pi r$

$= 2 \times 14 + \frac{15°}{360°} \times 2 \times 3.14 \times 14$

$= 28 + \frac{1}{24} \times 28 \times 3.14$

$= 28 + 3.66$

$= 31.66$ cm

122. (d) Perimeter of sector $= \frac{\theta}{360} \times 2\pi r + 2r$

$= 2r \left(\frac{\theta}{360} \times \pi + 1\right)$

$= 2 \times 24 \left(\frac{60}{360} \times 3.14 + 1\right)$

$= 48 \left(\frac{3.14}{6} + 1\right) = \frac{48 \times 9.14}{6}$

$= 73.12$ cm

123. (c) Perimeter of sector

$= 2\pi r \times \frac{\theta}{360°} + 2r$

$= 2 \times \frac{22}{7} \times 14 \times \frac{45°}{360°} + 2 \times 14$

$= 11 + 28 = 39$ cm

124. (c) Perimeter of sector $= \frac{\theta}{360°} \times 2\pi r + 2r$

$= \frac{45°}{360°} \times 2\pi \times 4 + 2 \times 4$

$= \frac{1}{8} \times 8\pi + 8 = (\pi + 8)$ units

125. (a) Length of sector $= \frac{\theta}{360°} \times 2\pi r$

$= \frac{120°}{360°} \times 2 \times \frac{22}{7} \times 7 = \frac{1}{3} \times 44$

$= \frac{44}{3}$ cm

126. (a) Length of arc $= \frac{\theta}{360°} \times 2\pi r$

$= \frac{45°}{360°} \times 2 \times \frac{22}{7} \times 4 = \frac{22}{7}$

Perimeter $= \frac{22}{7} + 4 + 4 = \frac{78}{7}$ cm

127. (b) Perimeter of sector
$= \frac{\theta}{360^\circ} \times 2\pi r + 2r$
Angle of Major Sector = 360° − 75°
= 285°
Perimeter of Major Sector
$= \frac{285^\circ}{360^\circ} \times 2\pi \times 12 + 2 \times 12$
= (19π + 24) meter

128. (a) Area of sector = $\frac{1}{2}$ × radius of circle × length of arc
$= \frac{1}{2} \times 12 \times 7 = 42\ cm^2$

129. (b) Area of sector = $\frac{1}{2}$ × length of arc × radius of circle
$= \frac{1}{2} \times 7 \times 24 = 84\ cm^2$

130. (d) Area of sector = $\frac{1}{2}$ × Length of arc × radius
$= \frac{1}{2} \times 7.5 \times 24 = 12 \times 7.5 = 90\ unit^2$

131. (b) Area of sector = $\frac{1}{2}$ × Length of arc × radius
$= \frac{1}{2} \times 15 \times 48 = 15 \times 24 = 360 m^2$

132. (a) Circumference of circle = 2πr
$\Rightarrow 2\pi r = 88$ cm
$\Rightarrow r = 14$
Length of arc $= \frac{\theta}{360^\circ} \times 2\pi r$
$\Rightarrow \frac{\theta}{360^\circ} \times 2\pi r = 22 \Rightarrow \theta = 90^\circ$
$\therefore$ Area of sector $= \frac{\theta}{360^\circ} \times \pi r^2$
$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 = 154\ cm^2$

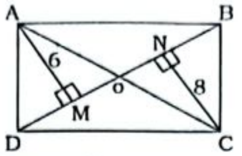
133. (d) Length of arc (l) = 20.6 − 7.4 − 7.4
= 20.6 − 14.8 = 5.8 cm
$\therefore$ Area of sector $= \frac{1}{2} \times r \times l$
$= \frac{1}{2} \times 7.4 \times 5.8 = 21.46\ cm^2$

134. (b) Length of arc (l) = 15.5 − 5 − 5
= 5.5 cm
$\therefore$ Area of the minor sector
$= \frac{1}{2} r \times l = \frac{1}{2} \times 5 \times 5.5 = \frac{27.5}{2}$
$= 13.75\ cm^2$

135. (c) Area of sector = $\frac{1}{2}$ × length of arc × radius of circle
$\Rightarrow 209 = \frac{1}{2} \times lr \Rightarrow lr = 418$
$\Rightarrow l \times r = 19 \times 22$
Perimeter = l + 2r
$\Rightarrow 63 = l + 2r$
By Hit and trial method, l = 19 and r = 22
$\therefore$ Length of arc $(l) = \frac{\theta}{360^\circ} \times 2\pi r$
$\Rightarrow 19 = \frac{\theta}{360^\circ} \times 2 \times \frac{22}{7} \times 22$
$\Rightarrow \theta = \frac{360^\circ \times 19 \times 7}{44 \times 22}$
$\Rightarrow \theta = 49.46^\circ \sim 49.5^\circ$

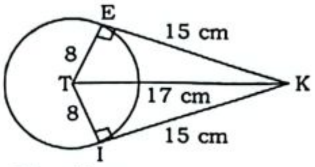
136. (a) Angle formed by minute hand in 45 minute
$= \frac{45}{60} \times 360^\circ = 270^\circ$
Required Area $= \frac{\theta}{360^\circ} \times \pi r^2$
$= \frac{270^\circ}{360^\circ} \times \frac{22}{7} \times 20 \times 20 = \frac{6600}{7}\ cm^2$

137. (a)



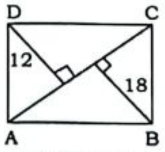
BD = 20 cm (Given)
Area of quadrilateral ABCD = Area of ΔABD + Area of ΔBCD
$= \frac{1}{2} \times BD \times (AM + CN) = \frac{1}{2} \times 20 \times (6 + 8)$
$= 10 \times 14 = 140\ cm^2$

138. (c)



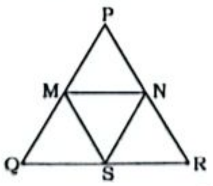
KE = KI = 15 cm
(Triplet of 8, 15, 17)
Area of Quadrilateral TEKI
$= 2 \times \frac{1}{2} \times 8 \times 15 = 120\ cm^2$

139. (d) AC = 20 m



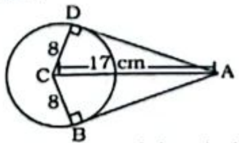
Area of quadrilateral = area of ΔABC and ΔADC
$= \frac{1}{2} \times 20(18 + 12) = 300$
$= 120 + 180 = 300 m^2$

140. (d)



Now, We have four equal equilateral triangle
So, Area of quadrilateral (MNRQ) = Area of ΔMQS + Area of ΔMSN + Area of ΔNRS
$= 46 \times \frac{3}{4}$
$= 34.5\ cm^2$.

141. (b)



AB = AD (Tangent of the circle)
Now,
$AB = AD = \sqrt{17^2 - 8^2} = 15$
$\therefore$ Area of □ABCD $= 2\left(\frac{1}{2} \times 8 \times 15\right)$
$= 120\ cm^2$

142. (a) Area of Rectangle = l × b
$= 52 \times 9\ m^2 = 468\ m^2$
Note:- It can be done with the help of unit digit.

143. (b) Let length and breadth of rectangle be a and b.
$2(a + b) = 70 \Rightarrow (a + b) = 35$
Diagonal $= \sqrt{a^2 + b^2} \Rightarrow a^2 + b^2 = 625$
$(a + b)^2 = a^2 + b^2 + 2ab$
$\Rightarrow 1225 = 625 + 2ab \Rightarrow 2ab = 600$
$\Rightarrow ab = 300\ cm^2$
$\therefore$ Area of rectangle = 300 cm²
Note:- It can be done with help of value putting.
a = 20 & b = 15.

144. (b) l = 45m, b = x
Area of rectangular field = l × b
$\Rightarrow 45 \times x = 3600\ m^2$
$\Rightarrow x = 80$ m
$\therefore$ Perimeter of rectangle = 2(l + b)
= 2(80 + 45) = 250 m

145. (a) Given, Area of rectangular field
$= 480 m^2$
Length is 20% $\left(\frac{1}{5}\right)$ more than breadth
$\Rightarrow b = \frac{5}{6} l$
$l \times b = 480$
Then, $l \times \frac{5l}{6} = 480$
$\Rightarrow l^2 = \frac{480 \times 6}{5} \Rightarrow 96 \times 6 \Rightarrow l^2 = 576$
$\Rightarrow l = 24$ m

146. (c) Let, Length = 3x & Width = 2x
ATQ, $3x \times 2x = 150$
$\Rightarrow 6x^2 = 150$
$\Rightarrow x = 5$
Length = 3 × 5 = 15 cm
Width = 2 × 5 = 10 cm
$\therefore$ Perimeter of rectangle = 2(l + b)
= 2(15 + 10) = 50 cm

147. (c) Given
l : b = 3 : 2
Perimeter of rectangular park = 2(l + b)
$2(3x + 2x) = 120$
$2 \times 5x = 120$
$x = 12$
Area of rectangular park = $3x \times 2x$
$= 6x^2 = 6 \times 12^2 = 6 \times 144 = 864\ m^2$

148. (d) a + b = 9, ab = 18
$a^2 - ab + b^2 = (a + b)^2 - 3ab$
$= (9)^2 - 3 \times 18 = 81 - 54 = 27$ cm.
Alternate Method:
$a + b = 9$
$ab = 18$
Putting value
$a = 6$ and $b = 3$
$\therefore a^2 - ab + b^2 = 36 - 18 + 9 = 27$

149. (a) Let, length of rectangle = x
Breadth of rectangle = x − 6
ATQ,
Perimeter of rectangle = 2(L + B)
$\Rightarrow 48 = 2(x + x - 6)$

$\Rightarrow 24 = 2x - 6$
$\Rightarrow x = 15$
$\therefore$ Area of garden $= x \times (x - 6)$
$= 15 \times (15 - 6) = 135\ m^2$

150. (b) Let breadth $= x$ m
Length $= (x + 15)$ m
Perimeter of rectangular park
$= 2\ (l + b)$
$\Rightarrow 110 = 2 \times (x + x + 15)$
$\Rightarrow 55 = 2x + 15 \Rightarrow x = 20$
$\therefore$ Length $= 20 + 15 = 35$ m

151. (d) Given, $x + y = 12cm$
$xy = 28cm^2$
$\because x^2 + y^2 = (x + y)^2 - 2xy$
$= 12^2 - 2 \times 28$
$= 144 - 56 = 88$
$\therefore x^4 + y^4 + x^2y^2 = (x^2 + y^2)^2 - x^2y^2$
$= (88)^2 - (28)^2 = 6960$

152. (b) Let, width $= x$
$\therefore$ Length $= x + 8$
Perimeter of rectangle = 2 (length + width)
Half perimeter = (length + width)
$= x + (x + 8) = 2x + 8$
$\therefore 2x + 8 = 42$
$\Rightarrow 2x = 42 - 8 = 34 \Rightarrow x = 17$
$\therefore$ Width $(x) = 17$, Length $= (x + 8)$
$= 17 + 8 = 25$
$\therefore$ Area of rectangle = Length × width
$= 25 \times 17 = 425\ cm^2$
Note:- It can be done with the help of unit digit.

153. (b) Increase by 6 and decrease by 6 it Means total deviation = 12 unit

$$2\left(\begin{matrix} 4 & : & 3 \\ 2 & : & 1 \end{matrix}\right)\begin{matrix} 2 \rightarrow 12 \\ 1 \rightarrow 6 \end{matrix}$$

Then, $6 \times (4) : 6 \times (3) = 24 : 18$ (increased value)
Actual value $= (24 - 6) : (18 - 6)$
= 18 meters, 12 meters

SMART APPROACH:-
By option,
$(18 + 6) : (12 + 6)$
$24 : 18$
$\Rightarrow 4 : 3$

154. (b) Length $= x$, Width $= (x - 2)$
ATQ, Perimeter = 68 m
$\Rightarrow 2\ (x + x - 2) = 68$
$\Rightarrow 4x - 4 = 68$
$\Rightarrow x = 18$
$\therefore$ Length = 18 m

155. (c) Diagonal $= \sqrt{(150^2) + (80)^2}$
$= 170$ m
Perimeter $= 2 \times 230 = 460$ m
ATQ,
$170 \times k = 460$
$\Rightarrow k = \frac{460}{170} = 2.7$ times

Note:

$$\text{Triplet}\quad \begin{matrix} 8, & 15, & 17 \\ \times 10\downarrow & \times 10\downarrow & \times 10\downarrow \\ 80 & 150 & 170 \end{matrix}$$

156. (a) Perimeter of a rectangle = 2(length + breadth)
$l + b = 30$ ......(i)
$l - b = 6$ ......(ii)
From (i) and (ii),
$l = 18$
$b = 12$
Area of a rectangle = length × breadth $= 18 \times 12 = 216\ cm^2$

157. (d) Length Breadth
$5x$ $3x$
Area $= l \times b \Rightarrow 15x^2 \Rightarrow 60 \Rightarrow x = 2$
Difference b/w length and breadth
$= 2x = 4m$

158. (c) Let, L = length & B = breadth of rectangle.
ATQ,
$(L - 4) = (B + 2)$
$\Rightarrow L - B = 6$ ....(i)
Also, $LB = (L - 4)\ (B + 2)$
$\Rightarrow LB = LB - 4B + 2L - 8$
$\Rightarrow 4B - 2L = -8$ ....(ii)
On solving (i) and (ii),
$\Rightarrow L + B = 10$
$\therefore$ Perimeter of original rectangle $= 2\ (L + B) = 2(10) = 20$ cm

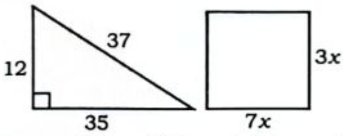
159. (c)

	Old	:	New
Length →	1	:	3
Breadth →	2	:	1
Area→	2	:	3

$\therefore$ Required area $= 2 : 3$

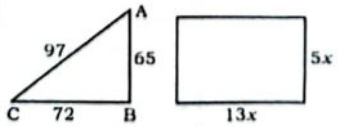
160. (a) Area of floor $= \frac{9100}{65} = 140\ m^2$
Given, $\frac{l}{b} = \frac{7}{5} = \frac{7x}{5x}$
$35x^2 = 140$
$\Rightarrow x^2 = \frac{140}{35} = 4 \Rightarrow x = 2$
$\Rightarrow l = 14m$, $b = 10m$
Perimeter $= 2(l + b) = 2(14 + 10)$
$= 48$ m

161. (b)



Given, sides of the right angles triangle follows triplet
ATQ,
Area of right angle triangle = area of rectangular park
$\Rightarrow \frac{1}{2} \times 12 \times 35 = 3x \times 7x$
$\Rightarrow x^2 = 10 \Rightarrow x = \sqrt{10}$
$\therefore$ Perimeter of rectangular park
$= 2(l + b) = 2(10x)$
$= 2 \times 10 \times \sqrt{10} = 20\sqrt{10}$ m

162. (c)

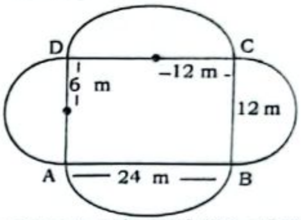


Given Δ is a right angled Δ.
ATQ,
Area of right angle triangle = area of rectangular park
$\Rightarrow \frac{1}{2} \times 72 \times 65 = 13x \times 5x$
$\Rightarrow x^2 = 36$
$\Rightarrow x = 6$
$\therefore$ Perimeter $= 2\ (l + b)$
$= 2\ (18x) = 36x = 216$ m

163. (a) (88, 165 and 187) is triplet
So,
Area of right-angle triangle = Area of square
$\Rightarrow \frac{1}{2} \times 88 \times 165 = 5x \times 3x$
$\Rightarrow x^2 = 11 \times 11 \times 2 \times 2$
$\Rightarrow x = 22$
$\therefore$ Perimeter of plot $= 2(l+b)$
$= 2(5x + 3x) = 2 \times 8x$
$= 2 \times 8 \times 22 = 352$
Note:- Since $x = 22$ which is multiple of 11, so find the multiple of 11 in options.

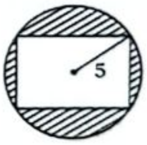
164. (d) Length = 4 m 95 cm = 495 cm
Breadth = 16 m 65 cm = 1665 cm
HCF (495, 1665) = 45 cm
Side of square = 45 cm
$\therefore$ No. of tiles $= \frac{\text{Area of Rectangle}}{\text{Area of Square}}$
$= \frac{1665 \times 495}{45 \times 45} = 11 \times 37 = 407$

165. (c)



Area of rectangle $= 12 \times 24 = 288\ m^2$
Ar. of circular portion of the lawn
$= \pi \times 12^2 + 6^2 \times \pi$
$= 3.14 \times (144 + 36)$
$= 3.14 \times 180 = 565.2\ m^2$
Total area of the lawn
$= 288 + 565.2 = 853.2\ m^2$

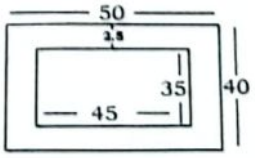
166. (b)



Radius of circle = 5
When a rectangle of maximum area is placed inside a circle then it behaves like a square.
Side of rectangle $= 5\sqrt{2}$
Area of remaining portion = Area of circle - Area of rectangle $= \pi r^2 - (5\sqrt{2})^2 = 25\pi - 50 = 25\ (\pi - 2)$

167. (c) Given, $l = 126$ ft. $b = 90$ ft.
HCF $(l, b) = 18$
$\therefore$ Area of tiles $= 18 \times 18 = 324\ ft^2$

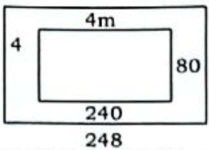
168. (d)



Area of path $= 50 \times 40 - 45 \times 35$
$= 2000 - 1575 = 425\ m^2$

Alternate Method:-
$l = 45$ m, $b = 35$ m, $x = 2.5$ m
Area of path $= 2x(l + b + 2x)$
$= 2 \times 2.5(45 + 35 + 2 \times 2.5)$
$= 5 \times 85 = 425\ m^2$

169. (d)



Area of a path = 248 × 88 – 240 × 80

Solve on last digit = 4 – 0

Last digit = 4

Alternate Method:

Area of path = $2x(l + b + 2x)$

= 2 × 4 (240 + 80 + 8)

= 8 × 328 = 2624m²

(It can be solved with the help of unit digit only option (d) satisfy)

170. (a) Perimeter of Square = 4 × a

⇒ 64 = 4 × a ⇒ a = 16 cm

∴ Area of Square = a² = 16 × 16

= 256 cm²

171. (d) Area of square = $\frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 4.8 \times 4.8 = 11.52\ m^2.$

Alternate Method:-

Given, Diagonal = 4.8

$\Rightarrow \sqrt{2}a = 4.8 \Rightarrow a = \frac{4.8}{\sqrt{2}}$

Area = $a^2 = \frac{4.8 \times 4.8}{\sqrt{2} \times \sqrt{2}}$

= 2.4 × 4.8 = 11.52 m²

172. (d) Side of square is 5 cm.

If side is doubled,

side = 10 cm.

Initial Area = 5 × 5 = 25 | New Area = 10 × 10 = 100

∴ The area is increased 4 times.

Alternate Method:

side	Area
5	25
10	100

×4

∴ Area increased by 4 times

173. (d) Side = $\frac{\text{Diagonal}}{\sqrt{2}} = \frac{8\sqrt{2}}{\sqrt{2}} = 8$

ATQ,

$3 \times 8 \times 8 = a^2 \Rightarrow a = 8\sqrt{3}$

Diagonal = √2 × Side

$= \sqrt{2} \times 8\sqrt{3} = 8\sqrt{6}$ cm

SMART APPROACH:-

We know that if we do 'n' times of area of square then the side and diagonal becomes $\sqrt{n}$ times.

The diagonal of new square

$= 8\sqrt{2} \times \sqrt{3} = 8\sqrt{6}$

174. (c) Distance = $(\sqrt{2} \times a)$km

Speed = 3 km/hr

Time = $\frac{5}{60}$ hr

$\Rightarrow \sqrt{2}a = 3 \times \frac{5}{60} = \frac{1}{4}\text{km} = \frac{1000}{4}\text{ m}$

$\Rightarrow a = \frac{250}{\sqrt{2}}$

Area $(a^2) = \frac{62500}{2}$

= 31250

175. (a) Area of path = $2x(l + b + 2x)$

⇒ 105.75 = 2 × 4.5 × (a + a + 2 × 4.5)

⇒ 105.75 = 9(2a + 9)

⇒ 2a + 9 = 11.75

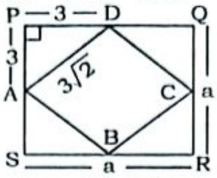
⇒ 2a = 2.75

Perimeter of square = 4a = 2 × 2a

= 2 × 2.75 = 5.5 m.

Cost = 5.5 × 100 = ₹550

176. (b)



Side of square (a) = $\sqrt{36}$ = 6 unit

$AD = \sqrt{3^2 + 3^2} = 3\sqrt{2}$

∴ Area of ABCD $= 3\sqrt{2} \times 3\sqrt{2}$

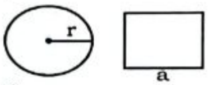
= 18 units²

SMART APPROACH:-

The area of square formed by joining the mid-points of sides of larger square will be half of area of larger square.

∴ Area of new square = $\frac{36}{2}$ = 18 sq. units

177. (a) Given,



$9\pi r^2 = 3a^2$

$\Rightarrow \frac{r^2}{a^2} = \frac{1}{3\pi} \Rightarrow \frac{r}{a} = \frac{1}{\sqrt{3\pi}}$

$\therefore \frac{\text{Diameter of circle}}{\text{Diagonal of square}}$

$= \frac{2r}{\sqrt{2}a} = \frac{2}{\sqrt{6\pi}} = \frac{\sqrt{2}}{\sqrt{3\pi}} = \sqrt{2} : \sqrt{3\pi}$

178. (d) Area of semicircle = $\frac{\pi r^2}{2} = \frac{\pi(2\sqrt{2})^2}{2}$

= 4π

ATQ,

Area of square = 4π

⇒ a² = 4π

$\Rightarrow a = 2\sqrt{\pi}$

∴ Perimeter of square = $4 \times 2\sqrt{\pi}$

$= 8\sqrt{\pi}$ cm

179. (c) Perimeter of square

= Perimeter of rectangle

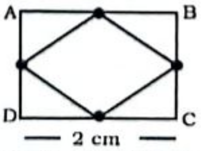
⇒ 4 × side = 2(Length + Breadth)

⇒ 4 × side = 2(10 + 8)

⇒ 4 × side = 36 ⇒ side = 9 cm

∴ Area of square = side² = 9² = 81 cm²

180. (d)



Let side of large square be 2 cm.

So, Area (S) = 2 × 2 = 4 cm²

and side of small square

$= \sqrt{1^2 + 1^2} = \sqrt{2}$

Area (A) = $\sqrt{2} \times \sqrt{2}$ = 2 cm²

$\therefore \frac{A}{S} = \frac{2}{4} = \frac{1}{2} = 0.5$

SMART APPROACH:-

The area of square formed by joining the mid-points of sides of larger square will be half of area of larger square.

$\frac{A}{S} = \frac{1}{2} = 0.5$

181. (b) Perimeter of square = 4a ⇒196

= 4a ⇒ a = 49

ATQ,

Side of square = Radius of circle = 49

Area of circle = $\frac{22}{7} \times 49 \times 49 = 7546\ m^2$

Note:- Use unit digit method to avoid calculation

182. (a) 4a = 172 ⇒ a = 43

Area of triangle = $\frac{(43)^2}{2} = 924.5$

183. (c) Area of square = 1156

⇒ a² = 1156 ⇒ a = 34

Length of rectangle = (34 × 2) = 68

Breadth of rectangle = (34 – 14) = 20

$\therefore \frac{L}{B} = \frac{68}{20} = \frac{17}{5} = 17 : 5$

184. (c) Radius of the circle = 7 cm

Square Side = (7 × 2) = 14 cm

So, difference b/w Area of the Square and the circle = $14^2 - \frac{22}{7} \times 49$

= (196 – 154) = 42

Alternate Method:-

Square : Circle

$$\begin{array}{lccc} \text{Area ratio} \rightarrow & 14 & : & 11 \\ & \downarrow 14\times & \underbrace{\hspace{3em}}_{\text{Diff.}} & \\ \text{Area} \rightarrow & 196 & & \begin{array}{l}3\text{ unit} = 3 \times 14\\ = 42\end{array} \end{array}$$

185. (a) Side of square = 12 cm, length of rectangle = 16 cm

Given that, perimeter of square = perimeter of rectangle.

⇒ 4 × 12 = 2(16 + b)

⇒ b = 8 cm

∴ Area of rectangle = l × b = 16 × 8

= 128 cm²

186. (b) Given, a² = 784 cm²

$\Rightarrow a = \sqrt{784}$ = 28 cm

∴ Radius of circle = $\frac{28}{2}$ = 14 cm

Area $= \frac{22}{7} \times 14 \times 14 = 616\ cm^2$

Alternate Method:-

Square : Circle

$$\begin{array}{lccc} \text{Area ratio} \rightarrow & 14 & : & 11 \\ & \downarrow \times 56 & & \downarrow \times 56 \\ \text{Area} \rightarrow & 784 & & \boxed{616} \end{array}$$

187. (c) Given, a² = 1764 ⇒ a = 42 m

ATQ, b = $\frac{42}{3}$ = 14 m

l = 2 × 14 = 28 m

Area = l × b = 14 × 28 = 392 m²

∴ Total cost = 15 × 392 = ₹5880

188. (b) ATQ,

$2\pi r = 2 \times \frac{22}{7} \times 7 = 44$

4a = 44 ⇒ a = 11

$\therefore \frac{\pi r^2}{a^2} = \frac{\frac{22}{7} \times 7 \times 7}{11 \times 11} = \frac{14}{11} = 14 : 11$

189. (d) **Case - I**

Diagonal of square $(a\sqrt{2}) = 7\sqrt{2}$

$\Rightarrow a = 7$ cm

Then base of triangle = 7 × 4 = 28 cm

Case - II

Area of square $(b^2) = 169$

$\Rightarrow b = 13$ cm

Height of triangle = 13 cm

Area of triangle $= \frac{1}{2} \times 28 \times 13 = 182\ cm^2$

190. (c) **Case - I**

diagonal of a square $(a\sqrt{2}) = 6\sqrt{2}$

$\Rightarrow a = 6$cm

Then base of triangle = 6 × 4 = 24 cm

Case - II

Area of a square $(b^2) = 144$

$\Rightarrow b = 12$ cm

Height of triangle = 12 cm

$\therefore$ Area of triangle $= \frac{1}{2} \times 24 \times 12$

$= 144\ cm^2$

191. (d) ATQ,

$4 \times 11 = 2\pi r$

$\Rightarrow 4 \times 11 = 2 \times \frac{22}{7} \times r \Rightarrow r = 7$ cm

192. (b) Diagonal of square $= \sqrt{2}a$

Area of square $= a^2 = \frac{(\text{Diagonal})^2}{2}$

Area of square A $= \frac{(a+b)^2}{2}$

Area of square B = 2 × Area of square A $= 2 \times \frac{(a+b)^2}{2} = (a+b)^2$

Side of square B = a + b

Diagonal of square B $= \sqrt{2}(a+b)$

Side of other square = diagonal of square B $= \sqrt{2}(a+b)$

Area of other square $= \left[\sqrt{2}(a+b)\right]^2$

$= 2(a+b)^2$

193.(d) Area of parallelogram = b × h

$= 26 \times 18 = 468\ cm^2$

Note:- It can be done with the help of unit digit.

194. (a) Area of parallelogram = Base × Height

B = 2h, (Given)

ATQ,

Base × Height = 338

$\Rightarrow 2h \times h = 338$

$\Rightarrow h^2 = 169 \Rightarrow h = 13$ cm

195. (a) Let height = x and base = $3x$

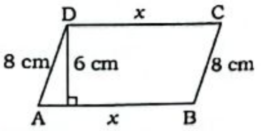
Area of parallelogram = base × height

$\Rightarrow x \times 3x = 1020\ cm^2$

$\Rightarrow 3x^2 = 1020 \Rightarrow x^2 = 340$

$\therefore x = \sqrt{340} = 2\sqrt{85}$ cm

196. (d)



Perimeter = 48 cm

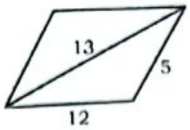
$\Rightarrow 8 \times 2 + 2x = 48$ cm

$\Rightarrow 2x = 32 \Rightarrow x = 16$ cm

$\therefore$ Area of parallelogram = base × height

$= 16 \times 6 = 96\ cm^2$

197. (a)



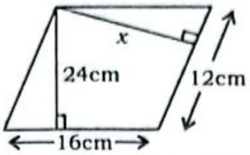
Given, sides form a right angled triangle. It means it is a rectangle

Then,

Area of rectangle = 12 × 5

$= 60\ cm^2$

198. (c)



Distance between other two Parallel sides = x

Here area is equal in both case

$\Rightarrow 16 \times 24 = 12 \times x$

$\Rightarrow x = 32$ cm

Note: In parallelogram height is inversely proportional to its corresponding sides.

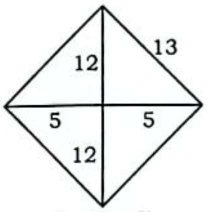
199. (b) $\therefore$ Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 10 \times 8.2 = 41\ cm^2$

200. (c) $\because$ Area of Rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 7.5 \times 5.6 = 21\ cm^2$

201. (d)



(Triplet → 5, 12, 13)

side = 13 cm

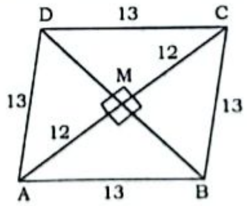
Perimeter = 4 × 13 = 52 cm

202. (a) Area of rhombus = base × height

$\Rightarrow 70 = \text{base} \times 5 \Rightarrow \text{Base} = 14$ m

$\therefore$ Perimeter = 4 × 14 = 56 m

203. (a)



Given,

$d_1 = AC = 24$ cm

$\because$ Diagonals of rhombus intersect at 90°

$\therefore AB^2 = AM^2 + MB^2$

$\Rightarrow 13^2 = 12^2 + MB^2$

$\Rightarrow MB^2 = 25 \Rightarrow MB = 5$

$\therefore d_2 = DB = 10$ cm

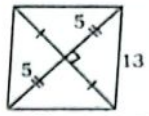
$\therefore$ Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 24 \times 10 = 120\ cm^2$

204. (d) Perimeter of rhombus (4a) = 52

$\Rightarrow a = 13$ cm

$d_1 = 10$ cm



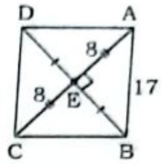
We know diagonal of rhombus bisect each other at 90°

$\Rightarrow d_2 = \left(\sqrt{13^2 - 5^2}\right) \times 2 = 24$ cm

$\therefore$ Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 10 \times 24 = 120\ cm^2$

205. (d)



$EB = \sqrt{17^2 - 8^2} = 15$

$\therefore d_1 = 16$ cm, $d_2 = 15 \times 2 = 30$ cm

$\therefore$ Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 16 \times 30 = 240\ cm^2$

206. (b) $d_1 = \frac{70}{100} d_2$

Area $= \frac{1}{2} \times d_1 \times d_2$

$\therefore$ Required ratio $= \frac{\frac{1}{2} \times d_1 \times d_2}{d_2^2}$

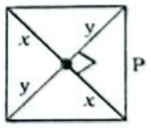
$= \frac{\frac{1}{2} \times \frac{70}{100} d_2 \times d_2}{d_2^2} = \frac{7}{20} = 7 : 20$

207. (c) Side of rhombus $= \frac{1}{2}\sqrt{d_1^2 + d_2^2}$

$= \frac{1}{2}\sqrt{1600 + 3600} = \frac{1}{2}\sqrt{5200}$

$= \frac{1}{2} \times 10 \times 2\sqrt{13} = 10\sqrt{13}$

208. (b)



Given, sum of diagonals = L

Let diagonals of rhombus = $2x$ and $2y$ and we know that diagonals of rhombus bisect each other at 90° then,

$2x + 2y = L$

$\Rightarrow x + y = \frac{L}{2}$ …… (i)

$x^2 + y^2 = P^2$

$\Rightarrow (x + y)^2 - 2xy = P^2$

$\Rightarrow \frac{L^2}{4} - 2xy = P^2$

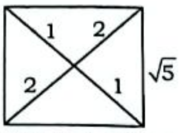
$\Rightarrow 2xy = \frac{L^2}{4} - P^2$

$\therefore$ Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 2x \times 2y = 2xy$

$= \frac{L^2}{4} - P^2 = \frac{1}{4}[L^2 - 4P^2]$

Alternate Method:
By value putting



Let diagonal are 4, 2 then,
L = 6, P = $\sqrt{5}$

Area = $\frac{1}{2} \times 4 \times 2$
= 4 unit^2

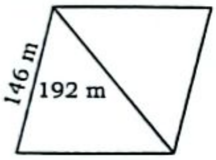
Only option 'c' satisfy the given values: $\frac{1}{4}(36 - 4 \times 5)$

= $\frac{1}{4} \times 16$ = 4 unit^2

SMART APPROACH:-

Given that,
$d_1 + d_2 = L$, perimeter of rhombus = 4P
Then, side of rhombus = P
Then, $d_2^2 + d_1^2 = 4P^2$
We know,
$(d_1 + d_2)^2 = d_1^2 + d_2^2 + 2d_1d_2 \Rightarrow L^2 = 4P^2 + 2d_1d_2$
$\Rightarrow d_1d_2 = \frac{1}{2}(L^2 - 4P^2)$
$\therefore$ Area of rhombus = $\frac{1}{4}(L^2 - 4P^2)$

209. (b)



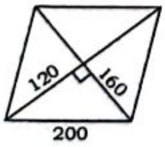
We know that, $(2a)^2 - (d_1)^2 = d_2^2$
$\Rightarrow (292)^2 - (192)^2 = d_2^2$
$\Rightarrow 484 \times 100 = d_2^2$
$\Rightarrow 48400 = d_2^2$
$\Rightarrow d_2 = 220$ m

Area = $\frac{1}{2} \times [d_1 \times d_2]$

= $\frac{1}{2} \times [192 \times 220]$ = 21120 m^2

Area in hectare = $\frac{21120}{10000}$
= 2.112 hectare

210. (c) Side of rhombus = $\frac{800}{4} = 200$

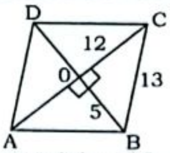


by triplet
120, 160, 200
Then,
$d_1 = 240$
$d_2 = 320$

Area of rhombus = $\frac{1}{2} \times [d_1 \times d_2]$

= $\frac{1}{2} \times 320 \times 240$
= 38400 m^2

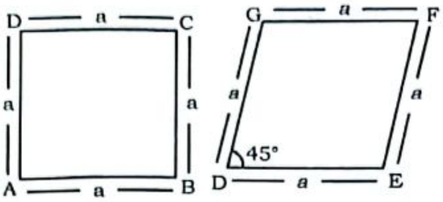
211. (d)



OB = 5 cm (triplet of 5, 12, 13)
$d_2 = 2 \times 5 = 10$ cm

Area = $\frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 10 \times 24$
= 120 cm^2

212. (d)



Area of square ABCD = a^2 units^2
Area of Rhombus DEFG = a^2 × Sinθ
= a^2 × Sin45° (∵ θ = 45°)

= $a^2 \times \frac{1}{\sqrt{2}} = \frac{a^2}{\sqrt{2}}$

Ratio = $a^2 : \frac{a^2}{\sqrt{2}} = \sqrt{2} : 1$

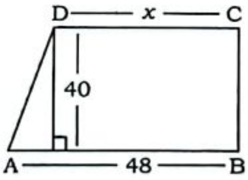
213. (d) Area of the trapezium = $\frac{1}{2}$ × sum of parallel sides × distance between parallel sides

= $\frac{1}{2} \times (17 + 15) \times 6 = 96$ cm^2
= 0.0096 m^2

214. (d) Area of trapezium = $\frac{1}{2}$ (sum of parallel side) × h

$\Rightarrow 1188 = \frac{1}{2}$ (sum of parallel sides) × 18
$\Rightarrow$ Sum of parallel sides = 132cm

215. (a)



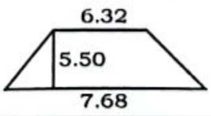
Area of trapezium = $\frac{1}{2}$ × (sum of parallel sides) × distance between parallel sides

$\Rightarrow 1720 = \frac{1}{2}(x + 48) \times 40$
$\Rightarrow 86 = x + 48$
$\Rightarrow x = 38$ meter

216. (c) Area of trapezium
= $\frac{1}{2}$ × Sum of parallel sides × distance between parallel sides

= $\frac{1}{2} \times (9 + 15) \times 6 = 72$ cm^2
Total cost = 72 × 3 = ₹216

217. (d)



Area of land = $\frac{1}{2}$ × (sum of parallel sides)× distance between parallel sides

= $\frac{1}{2} \times (7.68 + 6.32) \times 5.50$
= 38.5 sq. yards.
$\therefore$ Total amount to plough the entire land = 38.5 × 1200 = ₹46200

218. (b) Side (a) = 12 cm.
Total surface area of cube = 6a^2
= 6 × 12 × 12 = 864 cm^2

219. (c) Total surface area of cube = 6a^2
$\Rightarrow 1152 = 6a^2$
$\Rightarrow a^2 = 192$
$\Rightarrow a = 8\sqrt{3}$
$\therefore$ side of cube = $8\sqrt{3}$ cm.

220. (b) Largest diagonal of cube $(a\sqrt{3})$
= $6\sqrt{3} \Rightarrow a = 6$ cm
T.S.A of cube $(6a^2) = 6 \times 6^2 = 216$ cm^2

221. (d) Given,
Surface area of cube = 13.5 m^2
$\Rightarrow 6a^2 = 13.5$
$\Rightarrow a^2 = 2.25 \Rightarrow a = 1.5$
$\therefore$ Diagonal = $\sqrt{3}a = 1.5\sqrt{3}$

222. (a) Side of the cube = 11 cm
∵ Total surface area of cube = 6a^2
∵ Lateral surface area of cube = 4a^2
$\therefore$ Difference = $6a^2 - 4a^2 = 2a^2$
= $2 \times (11)^2 = 242$

223. (b) Volume of cube = a^3
= $(8)^3 = 512$ cm^3

224. (b) Volume of cube = (side)^3
$\Rightarrow$ $\sqrt[3]{13824}$ = side
$\Rightarrow$ side = 24 cm
$\therefore$Length of each side of cube = 24 cm.

225. (d) Volume of cube = $\left(\frac{\text{Diagonal}}{\sqrt{3}}\right)^3$

= $\left(\frac{7\sqrt{3}}{\sqrt{3}}\right)^3 = 343$ cm^3

226. (a) Let, side of cube = a
Surface area of cube = 6a^2
$\Rightarrow 6a^2 = 1728 \Rightarrow a = 12\sqrt{2}$
$\therefore$ Volume of cube
= $a^3 = (12\sqrt{2})^3 = 3456\sqrt{2}$ cm^3

227. (c) Let,
side of cube = a
Surface area of cube = $6a^2$
$\Rightarrow 486 = 6a^2$
$\Rightarrow a = 9$
$\therefore$ Volume of cube = (side)^3 = $(9)^3$
= 729 cm^3.

228. (a) Lateral surface area of cube = 4a^2
$\Rightarrow 144 = 4a^2 \Rightarrow a = 6$
$\therefore$ Volume of cube = $a^3 = 6^3$
= 216 cm^3

229. (b) Surface area of cube = $6a^2$
$\Rightarrow 6a^2 = 294 \Rightarrow a^2 = 49$
$\Rightarrow a = 7$
Volume of cube = a^3
= 7 × 7 × 7 = 343 cm^3

230. (a) T.S.A of cube = 6a^2
$\Rightarrow 6a^2 = 24$
$\Rightarrow a^2 = 4 \Rightarrow a = 2$
Volume = $a^3 = (2)^3$ = 8 cu. units

231. (b) Volume of cube = a^3
$\because\ a^3 = 64 \Rightarrow a = 4$
$\therefore$ T.S.A. of cube = $6a^2$
$= 6 \times (4)^2 = 96\ cm^2$

232. (c) Given, Volume of cube = 12167
$\Rightarrow a^3 = 12167 \Rightarrow a = 23$
T.S.A of cube = $6a^2$
$= 6 \times 529 = 3174\ cm^2$
Note:- Digital sum of 6×529
$= 6 \times 7 = 6$
Digital sum of 3174 = 6

233. (b) Volume of cube = a^3
(3D)Volume → 1000 : 729
(1D) side → 10 : 9
Diff.
1
% reduction in side of cube
$= \frac{10-9}{10} \times 100 = 10\%$

234. (a) Volume of cube = a^3
$$\frac{\text{Volume of cube}_1}{\text{Volume of cube}_2} = \frac{a_1^3}{a_2^3}$$
$$\Rightarrow \frac{1}{125} = \frac{a_1^3}{a_2^3} \Rightarrow \frac{a_1}{a_2} = \frac{1}{5}$$
Total surface area of cube = $6a^2$
$$\therefore \frac{a_1^2}{a_2^2} = \frac{1}{25}$$
Alternate Method:
(3D) Volume → 1 : 125
(1D) Side → 1 : 5
∴ (2D) Area → 1 : 25

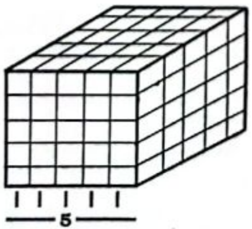
235. (d) ATQ,
$a^3 = 6^3 + 8^3 + 10^3$
$\Rightarrow a^3 = 1728 \Rightarrow a = 12$

236. (c)
Surface area of cube : Volume of cube
$\Rightarrow 6a^2 : a^3$
$\Rightarrow 6 \times 9 : 27$
$\Rightarrow 2 : 1$
∴ Required ratio = 2 : 1

237. (c) Total surface area of cube = $6a^2$
Ratio of total surface area of small cube to that of large cube =
$6 \times 2 \times 2 : 6 \times 4 \times 4 = 1 : 4$
Alternate Method:
S.C : L.C
(1D)Side → 2cm 4cm
1 : 2
∴(2D)Area → 1 : 4

238. (a) Volume of cube
$$= \left(\frac{\text{Perimeter}}{4}\right)^3 = \left(\frac{40}{4}\right)^3 = 1000\ cm^3$$

239. (b)



When we remove one cube in middle then we get 4 extra surfaces at 6 faces.
Then total area = 6 × (side of bigger cube)^2 + 6 × 4 × (side of small cube)^2
$= 6 \times 5^2 + 6 \times 4 \times 1^2$
$= 150 + 24 = 174\ cm^2$

240. (a) Volume of cube = (Side)^3
$\Rightarrow$ Side = $\sqrt[3]{512} = 8$ unit
∴ Paper required to make cube = 6 (side)^2 = 6 × 64 unit^2 = 384 unit^2
Note:- It can be done with the help of unit digit.

241. (b) Total surface area of cuboid
$= 2(lb + bl + hl)$
$= 2(5 \times 7 + 7 \times 11 + 11 \times 5)$
$= 2(35 + 77 + 55)$
$= 2 \times 167 = 334\ cm^2$

242. (a) Total surface area of cuboid
$= 2(LB + BH + HL)$
$= 2(11 \times 7 + 7 \times 4 + 4 \times 11)$
$= 2(77 + 28 + 44)$
$= 2 \times 149 = 298$
Note:- Go through unit digit to avoid full calculation.

243. (c) T.S.A of Cuboid
$= 2(lb + bh + hl)$
$= 2(12 \times 8 + 12 \times 14 + 14 \times 8)$
$= 2(96 + 168 + 112)$
$= 2 \times 376 = 752\ cm^2$

244. (d) Total surface area of cuboid
$= 2(lb + bh + hl)$
$= 2(19 \times 9 + 9 \times 4.5 + 4.5 \times 19)$
$= 2(171 + 40.5 + 85.5)$
$= 2 \times 297 = 594\ cm^2$

245. (c) $l = 18cm$, $b = 12cm$, $h = 10cm$
Total surface area of cuboid
$= 2(lb + bh + hl)$
$= 2(18 \times 12 + 12 \times 10 + 10 \times 18)$
$= 2(216 + 120 + 180)$
$= 516 \times 2 = 1032\ cm^2$

246. (c) Area of Cardboard
$= 2(lb + bh + hl)$
$= 2(20 \times 10 + 10 \times 8 + 8 \times 20)$
$= 2(200 + 80 + 160)$
$= 2 \times 440 = 880\ cm^2$

247. (b) Total surface area of cuboid
$= 2(LB + BH + HL)$
$\Rightarrow 108 = 2 \times (6 \times 3 + 3 \times H + 6 \times H)$
$\Rightarrow 54 = (18 + 9H) \Rightarrow 9H = 36$
$\Rightarrow H = 4\ m$
∴ Height of cuboid = 4

248. (d) Total Surface Area of cuboid
$= 2 \times (LB + BH + HL)$
$\Rightarrow 2600 = 2 \times (30 \times 20 + 20 \times H + H \times 30)$
$\Rightarrow 1300 = 600 + 50H$
$\Rightarrow H = 14\ cm$

249. (d)

	l		b		h
Ratio →	1	:	4	:	2
Actual →	4		16		8

Lateral surface area = $2(l + b) \times h$
$= 2(20) \times 8 = 320\ cm^2$

250. (a)

	L		B		H
Ratio →	2	:	1	:	4
Actual →	10		5		20

Lateral surface area = $2(l + b) \times h$
$= 2(15) \times 20 = 600\ cm^2$

251. (c) Length = 60 cm, breadth = 30 cm, height = 10 cm.
Total surface area of cardboard box
$= 2(lb + bh + hl)$
$= 2(60 \times 30 + 30 \times 10 + 10 \times 60)$
$= 2(1800 + 300 + 600) = 5400\ cm^2$

252. (d) Given, b = 6 cm,
Then, $l = 6 \times 3 = 18cm$,
$h = 6 \times 2 = 12cm$
T.S.A = $2(lb + bh + lh)$
$= 2(18 \times 6 + 6 \times 12 + 18 \times 12)$
$= 2(108 + 72 + 216)$
$= 2 \times 396 = 792\ cm^2$

SMART APPROACH:-
T.S.A = $2(lb + bh + lh)$
$= 2(18 \times 6 + 6 \times 12 + 18 \times 12)$
$= 2 \times 9\ (12 + 8 + 24)$
↓
Given equation is multiple of 9. So, check through option 'd' is correct

253. (d) Given, h = 8
$2h(l + b) = 720$, $l : b = 5 : 1$
$$l + b = \frac{720}{2 \times 8} = 45 \begin{cases} \frac{45}{6} \times 5 = 37.5\ (l) \\ \frac{45}{6} \times 1 = 7.5\ (b) \end{cases}$$
Total surface area = $2h(l + b) + 2lb$
$= 720 + 2 \times 37.5 \times 7.5$
$= 720 + 562.5 = 1282.5\ cm^2$

254. (a) $l = 8$, $b = 16$, $h = 4$
T.S.A = $2(lb + bh + lh)$
$= 2(8 \times 16 + 16 \times 4 + 8 \times 4)$
$= 2(224) = 448\ cm^2$

255. (b) Let, $l = 3$, $b = 1$, $h = 2$
T.S.A of cuboid = $2(lb + bh + lh)$
$= 2(3 + 2 + 6)$
$= 2 \times 11 = 22\ cm^2$

256. (d) $LB = 5\ cm^2$, $BH = 15\ cm^2$,
$HL = 27\ cm^2$
∴ Total surface area of cuboid
$= 2(LB + BH + HL)$
$= 2 \times (5 + 15 + 27) = 2 \times 47$
$= 94\ cm^2$

257. (a) Required area
$= 2(l + b) \times h + l \times b$
$= 2 \times (12) \times 3 + 35 = 107 m^2$
Total cost = 107 × 16 = ₹ 1712
Note: To avoid calculation use digital sum method.

258. (a) Total area of room
$= 2(l + b) \times h + lb$
$= 2(12 + 8) \times 10 + 12 \times 8$
$= 400 + 96 = 496\ cm^2$
∴ Total cost = 496 × 25 = ₹12400

259. (b) Area of four walls of room
$= 2(l + b) \times h$
$= 2(15 + 9) \times 5 = 240 m^2$
∴ Number of cans required $= \frac{240}{40} = 6$

260. (c) Total surface area before cutting
$= 2(lb + bh + hl)$
$= 2(20 \times 12 + 12 \times 10 + 10 \times 20)$
$= 2(240 + 120 + 200)$
$= 2 \times 560 = 1120\ cm^2$
There are three cuts along length-breadth, breadth-height and height-length.
After cutting into 8 equal parts, area will be doubled.
∴ total surface area after cutting
$= 2 \times 1120 = 2240\ cm^2$

261. (b) Length of longest diagonal
$= \sqrt{l^2 + b^2 + h^2}$
$= \sqrt{1.2^2 + 1.3^2 + 1.5^2}$
$= \sqrt{1.44 + 1.69 + 2.25}$
$= \sqrt{5.38}$
$= 2.32\ cm$

262. (b) Longest stick = length of diagonal cubical vessel
$= a\sqrt{3} = 70\sqrt{3}$ cm

263. (d) $l + b + h = 20$ cm
$2(lb + bh + hl) = 256$ cm²
$(l + b + h)^2 = l^2 + b^2 + h^2 + 2(lb + bh + hl)$
$\Rightarrow 400 = l^2 + b^2 + h^2 + 256$
$\Rightarrow l^2 + b^2 + h^2 = 400 - 256$
$\Rightarrow l^2 + b^2 + h^2 = 144$
$\Rightarrow \sqrt{l^2 + b^2 + h^2} = \sqrt{144}$
Diagonal $(\sqrt{l^2 + b^2 + h^2}) = 12$ cm

Alternate Method:
Total surface area
$= (l + b + h)^2 - \text{diagonal}^2$
$\Rightarrow 256 = 20^2 - \text{diagonal}^2$
$\Rightarrow \text{diagonal}^2 = 400 - 256$
$\Rightarrow$ diagonal = 12 cm

264. (d) Given, $l + b + h = 20$cm
$\sqrt{l^2 + b^2 + h^2} = 12 \Rightarrow l^2 + b^2 + h^2 = 144$
Now,
$(l + b + h)^2 = 20^2$
$\Rightarrow l^2 + b^2 + h^2 + 2(lb + bh + hl) = 400$
$\Rightarrow 144 + 2(lb + bh + hl) = 400$
$\Rightarrow 2(lb + bh + hl) = 256$cm²

Alternate Method:
Total surface area $= (l + b + h)^2 - d^2$
$= 20^2 - 12^2 = 400 - 144 = 256$ cm²

265. (b) $l + b + h = 23$ cm
Diagonal $= 5\sqrt{7}$ cm
TSA $= (l + b + h)^2 - (d)^2$
$= 23^2 - (5\sqrt{7})^2 = 529 - 175 = 354$ cm²

266. (a) Capacity of pond
$= L \times B \times H = 20 \times 14 \times 6 = 1680$ m³

267. (b) Capacity of pond
$= 50\text{m} \times 35\text{m} \times 2.5\text{m} = 4375\text{m}^3$

268. (c) Let, breadth of the wall
$= x$, height $= 6x$ and length $= 3x$.
Volume = Length × Breadth × Height
$\Rightarrow 23958 = 3x \times x \times 6x$
$\Rightarrow x^3 = \frac{23958}{18} = 1331$
$\Rightarrow x = 11$
∴ Breadth of the wall = 11 cm.

269. (c) Given, h = 20
and, $l \times b \times h = 4800$
$\therefore$ Area of base $= (l \times b) = \frac{4800}{20}$
$= 240$ cm²

270. (d) Volume of tank = 10 liters
$= 10000$ cm³
Let height $= h$, Breadth $= \frac{h}{5}$, Length
$= \frac{1}{3}\left(h + \frac{h}{5}\right) = \frac{2h}{5}$
ATQ,
Volume of cuboid $= l \times b \times h$
$\Rightarrow h \times \frac{h}{5} \times \frac{2h}{5} = 10000$
$\Rightarrow 2h^3 = 250000$
$\Rightarrow h^3 = 125000$
$\Rightarrow h = 50$ cm

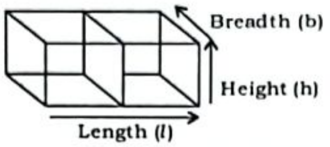
271. (a) $V = l \times b \times h$
$A_1\ (l \times b) = 729$, $A_2\ (b \times h) = 529$, $A_3\ (b \times l) = 289$
$l^2 b^2 h^2 = 729 \times 529 \times 289$
$\Rightarrow V^2 = 729 \times 529 \times 289$
$\Rightarrow V = 27 \times 23 \times 17 = 10557$ cm³
Note:- Use unit digit method to avoid calculation

272. (b) Volume of cuboid $= L \times B \times H$
Area of adjacent face = LB, BH, HL
ATQ,
$L^2B^2H^2 = 120 \times 72 \times 60$
$\Rightarrow V^2 = 7200 \times 72$
$\Rightarrow V = 720$ cm³
Hence, volume of boxes = 720

273. (b) Let the length, breadth and height of cuboid l, b and h respectively.
A.T.Q.
$p = lb$
$q = bh$
$r = hl$
$\because p \times q \times r = (lbh)^2 \Rightarrow lbh = \sqrt{pqr}$
$\therefore$ Volume $= \sqrt{pqr}$ unit³

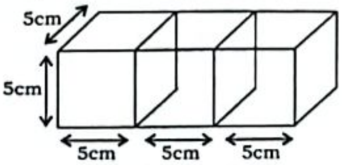
274. (b) ∵ Longest diagonal of cubical box
$= a\sqrt{3}$
$\Rightarrow a\sqrt{3} = \sqrt{300}$
$\Rightarrow a = 10$ cm.
$\therefore$ Volume of cube $= a^3 = 10^3 = 1000$ cm³

275. (d)



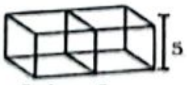
When two cubes are joined end to end then length = 10cm, Breadth = Height = 5 cm
Total surface area of cuboid
$= 2 \times (LB + BH + HL)$
$= 2 \times (10 \times 5 + 5 \times 5 + 5 \times 10)$
$= 2 \times (50 + 25 + 50) = 250$ cm²

276. (c)



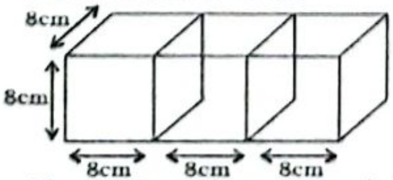
When 3 cubes of each side 5 cm are joined end to end then length
$= 3 \times 5 = 15$ cm,
Breadth = Height = 5 cm
Total surface area of cuboid
$= 2(LB + BH + HL)$
$= 2 \times (15 \times 5 + 5 \times 5 + 5 \times 15)$
$= 2 \times (75 + 25 + 75)$
$= 2 \times 175 = 350$ cm²

277. (d) Given,
$a^3 = 125$ cm³ $\Rightarrow a = 5$ cm



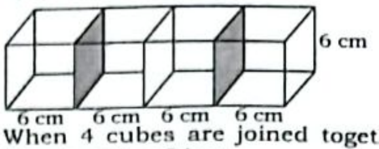
$l = 10$, b = 5, h = 5
Surface area $= 2(lb + bh + hl) = 2(50 + 25 + 50) = 2 \times 125 = 250$ cm²

278. (a) Volume of cube = (side)³
$\Rightarrow 512 = \text{side}^3$
$\Rightarrow$ Side = 8 cm
Side of each cube = 8 cm



After joining cube we get cuboid, then length = 24, height = 8, breadth = 8
Surface area of cuboid
$= 2(lb + bh + hl)$
$= 2(24 \times 8 + 8 \times 8 + 24 \times 8)$
$= 2 \times 448 = 896$ cm²

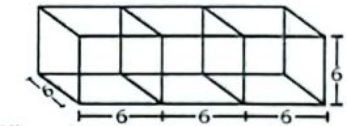
279. (b) Volume of cube $= a^3$
$\Rightarrow a^3 = 216 \Rightarrow a = 6$



When 4 cubes are joined together then length = 24cm,
breadth = height = 6 cm
Total surface area of cuboid $= 2(lb + bh + hl) = 2 \times (24 \times 6 + 6 \times 6 + 6 \times 24)$
$= 2 \times (144 + 36 + 144) = 2 \times 324$
$= 648$ cm²
Note:- It can be done with the help of unit digit.

280. (c) Volume of cube $= a^3$
$\Rightarrow 1728 = a^3 \Rightarrow a = 12$
When 4 solid cubes are placed in each 2 row, then demensions of cuboid are
$l = 24$, b = 24, h = 12
∴ Total surface area of cuboid
$= 2(lb + bh + hl)$
$= 2(24 \times 24 + 24 \times 12 + 24 \times 12)$
$= 2(576 + 288 + 288)$
$= 2 \times 1152 = 2304$ cm²

281. (b) Side $= \frac{\text{Diagonal}}{\sqrt{3}} = \frac{6\sqrt{3}}{\sqrt{3}} = 6$ cm



When 3 cubes are joined then
$l = 18$, b = h = 6
T.S.A. of resultant cuboid
$= 2(lb + bh + hl)$
$= 2(6 \times 18 + 18 \times 6 + 6 \times 6)$
$= 2 \times (108 + 108 + 36)$
$= 2 \times 252 = 504$ cm²
Note:- Answer will be multiple of 9.

282. (b) Volume of cuboid $= L \times B \times H$
ATQ,
$3x \times 4x \times 5x = 1620$
$\Rightarrow x^3 = 27 \Rightarrow x = 3$
Length = 9m, breadth = 12m, height = 15m
Total surface area of cuboid
$= 2 \times (LB + BH + HL)$
$= 2 \times (9 \times 12 + 12 \times 15 + 15 \times 9)$
$= 2 \times (108 + 180 + 135) = 2 \times 423$
$= 846$ m²

283. (a) Surface area of cube
$= 6a^2 = 6 \times 6 \times 6 = 216$ unit²
ATQ,
$2(3x \times 4x + 4x \times 5x + 5x \times 3x) = 216$
$\Rightarrow 47x^2 = 108 \Rightarrow x^2 = 2.29$
$\Rightarrow x \sim 1.51$
$\therefore$ Volume of cuboid $= 3 \times 4 \times 5 \times (1.51)^3$
$= 206.5 \sim 210$

284. (b) Length   Breadth   Height

$$\begin{array}{ccccc} 3 & : & 2 & : & 1 \\ \big\downarrow{\scriptstyle\times 6} & & \big\downarrow{\scriptstyle\times 6} & & \big\downarrow{\scriptstyle\times 6} \\ 18\text{ cm} & & 12\text{ cm} & & 6\text{ cm} \end{array}$$

Volume of cuboid $= l \times b \times h$
$= 18 \times 12 \times 6 = 1296$ cm³
Note: - It can be done with the help of unit digit

285. (c) Volume of cuboid = L × B × H
ATQ,
$4x \times 3x \times 2x = 12288$
$\Rightarrow 24x^3 = 12288$
$\Rightarrow x^3 = 512 \Rightarrow x = 8$
Length = 4 × 8 = 32m,
Breadth = 3 × 8 = 24m,
Height = 2 × 8 = 16 m
Total surface area of cuboid
= 2 (LB + BH + HL)
= 2 × (32 × 24 + 24 × 16 + 16 × 32)
= 2 × (768 + 384 + 512) = 2 × 1664
= 3328 m^2
∴ Total cost of polishing
$= 3328 \times \frac{2}{100}$ = Rs. 66.56

Note: It can be done with the help of unit digit.

286. (d) Total surface area of cuboid
= 2 (LB + BH + HL)
$\Rightarrow 632 = 2 \times (3x \times 5x + 5x \times 8x + 8x \times 3x)$
$\Rightarrow 632 = 2 \times 79x^2$
$\Rightarrow x = 2$
Length = 6cm, Breadth = 10cm, Height = 16cm
∴ Volume of box = 6 × 10 × 16 = 960 cm^3

287. (b) Let, Length = $4x$
Breath = $2x$
Height = x
Volume of room = L × B × H
$\Rightarrow 4x \times 2x \times x = 1728$
$\Rightarrow 8x^3 = 1726$
$\Rightarrow x^3 = 216 \Rightarrow x = 6$
∴ Length of room = $4x = 24\ m$

288. (b) Let Length, width & height of Cuboid are $6x$, $3x$ & $2x$.
ATQ, $2(lb + bh + hl) = 1800\ cm^2$
$\Rightarrow 2(18x^2 + 6x^2 + 12x^2) = 1800\ cm^2$
$\Rightarrow 72x^2 = 1800 \Rightarrow x^2 = 25$
$\Rightarrow x = 5$ cm
Thus,
l = 30 cm, b = 15 cm, h = 10 cm
∴ V = l × b × h = 30 × 15 × 10
= 4500 cm^3

SMART APPROACH:-
$V = 6x \times 3x \times 2x = 36x^3$
So, Ans. should be multiple of 9
Only option (b) satisfies.

289. (c) Required no of bricks
$= \frac{\text{Volume of Wall}}{\text{Volume of 1 Brick}}$
$= \frac{14 \times 0.125 \times 5}{0.0014} = 6250$

290. (a) Volume of Tank = l × b × h
= 50 × 25 × 10 = 12500m^3
= 12500000 liter

291. (a) 1 feet = 12 inch
48 inch → $\frac{48}{12}$ = 4 feet
27 inch → $\frac{27}{12} = \frac{9}{4}$ feet
30 inch → $\frac{5}{2}$ feet
T.S.A = $2(lb + bh + hl)$
$= 2\left(4 \times \frac{9}{4} + \frac{9}{4} \times \frac{5}{2} + \frac{5}{2} \times 4\right)$
$= \left(18 + \frac{45}{4} + 20\right)$
= 18 + 11.25 + 20 = 49.25

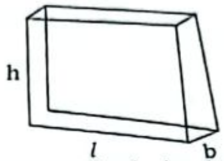
292. (d) No. of bricks required
$= \frac{1000 \times 22.5 \times 600}{25 \times 12 \times 9}$
= 1000 × 2.5 × 2 = 5000

293. (a) No. of such article $= \frac{63 \times 42 \times 21}{9 \times 6 \times 3}$
= 343

294. (b) No. of boxes needed
$= \frac{2160}{6 \times 10 \times 12} = 3$

295. (d) Let total no of cakes packed be x
∴ 160cm × 90cm × 60cm = x × 6 × 5 × 4
10 mm = 1 cm
40 mm = 4 cm
$\therefore x = \frac{160 \times 90 \times 60}{5 \times 6 \times 4} = 7200$

296. (c) Given,
Volume of wall = 51.2 m^3
h = 10b
l = 8h = 80b



Volume of wall = l × b × h
⇒ 51.2 = 80b × b × 10b
$\Rightarrow b^3 = \frac{51.2}{800} = \frac{512}{8000}$
$\Rightarrow b = \sqrt[3]{\frac{512}{8000}} \Rightarrow b = \frac{8}{20} = \frac{2}{5}$ m
$\therefore h = 10 \times \frac{2}{5} = 4$m
and $l = 80 \times \frac{2}{5} = 32$m
Cost of painting the wall on one side
= 4 × 32 × 100 = ₹12800

NOTE:-
We can get answer by option which option is multiple of 8 is right answer

297. (c) Length after cutting square of side 5 cm = 60 – 5 × 2 = 50
Breath after cutting square of side 5 cm
= 25 – 5 × 2 = 15
H = 5
∴ Volume = L × B × H = 50 × 5 × 15
= 3750 cm^3

298. (d) Volume of cuboid = l × b × h
Volume of empty box = volume of box with external dimensions – volume of box with internal dimensions
= 60 × 40 × 20 – [(60 – 2) × (40 – 2) × (20 – 2)]
= 48000 – 39672 = 8328 cm^3
1 cm^3 = 50 gm
8328 cm^3 = $\frac{50}{1000}$ × 8328 kg.
= 416.40 kg
∴ Weight of empty box = 416.40 kg.

299. (b) Volume of wood = [(128 + 2 × 5.5) × (90 + 2 × 5.5) × (25 + 2 × 5.5)] – 128 × 90 × 25
= 139 × 101 × 36 – 128 × 90 × 25
= 505404 – 288000 = 217404 cm^3
Note : 9 × 1 × 6 - 8 × 0 × 5 = 4 - 0 = 4
Unit digit of the answer should be 4. Only option (b) satisfy.

300. (c) V = 22.5 $feet^3$ = 22.5 × 12 × 12 × 12 $(inches)^3$
l = 48 inches, b = 27 inches
ATQ,
22.5 × 12 × 12 × 12 = 48 × 27 × h
⇒ h = 30 inches

301. (b) Volume of bricks
= 25 cm × 11.25 cm × 6 cm.
Volume of wall = 8m × 6m × 22.5 cm.
$\therefore$ No. of bricks $= \frac{\text{Volume of wall}}{\text{Volume of bricks}}$
$= \frac{800 \times 600 \times 22.5}{25 \times 11.25 \times 6} = 6400$

302. (b) Given,
4 × Volume of cuboid = Volume of cube
⇒ 4 × l.b.h. = $a^3 \Rightarrow a^3 = 4(32 \times 8 \times 4)$
$\Rightarrow a = \sqrt[3]{4 \times 32 \times 8 \times 4}$
⇒ a = 4 × 4 = 16 cm
$\therefore \frac{\text{T.S.A of cube}}{\text{T.S.A of cuboid}} = \frac{6a^2}{2(lb + bh + hl)}$
$= \frac{6 \times 16 \times 16}{2(32 \times 8 + 8 \times 4 + 4 \times 32)} = 24 : 13$

303. (b) Length = 10 cm
Inner Length = 10 – 2 × 0.5 = 9 cm
Broad = 8 cm
Inner broad = (8 – 2 × 0.5) = 7 cm
Height = 6 cm
Inner Height = (6 – 2 × 0.5) = 5 cm
∴ Wooden's volume = (10 × 8 × 6) – (9 × 7 × 5) = 480 – 315 = 165 cm^3

304. (a) I. Volume of cuboid = 6 × 7 × 8
= 336 cm^3
II. Volume of cube = 7×7×7 = 343 cm^3
Cube will have more volume.

305. (d) ATQ,
Volume of cuboid = 2 × volume of cube
⇒ l × b × h = $2(a)^3$
⇒ $2(a)^3 = 8 \times 8 \times 16 \Rightarrow a^3 = 512$
⇒ a = 8
TSA of cube = $6a^2$
= 6 × 8 × 8 = 384 m^2

306. (c) Volume of cube = a^3
No. of cubes $= \frac{3m \times 3m \times 3m}{15cm \times 15cm \times 15cm}$
$= \frac{300 \times 300 \times 300}{15 \times 15 \times 15} = 20 \times 20 \times 20$
= 8000

307. (b) HCF of (50, 150 and 175) = 25
Side of each cube = 25 cm
Number of identical largest cubes =
$\frac{\text{Volume of cuboid}}{\text{Volume of cube}}$
$= \frac{50 \times 150 \times 175}{25 \times 25 \times 25} = 84$

308. (d) Curved surface area of cylinder = 2πrh
$= 2 \times \frac{22}{7} \times 3 \times 14 = 44 \times 6$
= 264 cm^2
Note:- It can be done with the help of unit digit.

309. (c) Curved surface area of cylindrical tank = 2πrh.
$= 2 \times \frac{22}{7} \times 14 \times 42 = 3696.$
Note:- It can be done with the help of digital sum method.

$2 \times \frac{22}{7} \times 14 \times 42$
DS = 88 × 42 = 6
DS of 3696 = 6

310. (d) Curved surface area of cylinder
$= 2\pi rh$

$\Rightarrow 880 = 2 \times \frac{22}{7} \times rh$

$\Rightarrow rh = 20 \times 7 = 140\ cm^2$

311. (c) Given, h = 56 cm,
ATQ,
$2\pi rh = 1408$

$\Rightarrow 2r = \frac{1408}{\pi \times h} = \frac{1408 \times 7}{22 \times 56} = 8\ cm$

Diameter $(2r) = \frac{8}{100} m = 0.08\ m$

312. (b) Circumference of base of cylinder
$(2\pi r) = 132$

$\Rightarrow r = \frac{132 \times 7}{2 \times 22} = 21\ cm$

C.S.A of cylinder $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 21 \times 45 = 5940\ cm^2$

313. (a) ATQ,
$2\pi rh = 5 \times \pi r^2$
$\Rightarrow 2h = 5r \Rightarrow r : h = 2 : 5$

314. (b)

Cylinder$_1$: Cylinder$_2$

C.S.A → $2\pi r_1h_1$: $2\pi r_2h_2$

Now,

r_1h_1 : r_2h_2

4 × 5 : 5 × 7

Ratio → $\boxed{4 : 7}$

315. (c) $d = 1m \Rightarrow r = 0.5m$

$h = \frac{5}{4} m$

∴ Area covered in one round
= C.S.A. of cylinder $= 2\pi Rh$

$= 2 \times \frac{22}{7} \times \frac{1}{2} \times \frac{5}{4} = \frac{55}{14}\ m^2$

1 minute $= 14 \times \frac{55}{14} = 55\ m^2$

60 minute $= 60 \times 55 = 3300\ m^2$

316. (d) Radius of roller (r) = 17.5 cm
Length of roller (h) = 100 cm
C.S.A of roller $= 2\pi rh \times n$

$= 2 \times \frac{22}{7} \times 17.5 \times 100 \times 200$

$= 2200000\ cm^2$
$= 220\ m^2$

317. (d) Area of playground
$= 2\pi rh \times n$

$= 2 \times \frac{22}{7} \times 49 \times 200 \times 700$

$= 4312 \times 10^4\ cm^2$

318. (c) The radius of the wooden cylinder
$= \frac{70}{2} = 35\ cm = 0.35\ m$

Total cost = C.S.A of cylinder × 50

$= 2 \times \left(\frac{22}{7}\right) \times 0.35 \times 6 \times 50$

= ₹ 660

Note:- We know π is multiple of 11 and denominatior 7 will cancel the radius. Thus, Total cost will also be multiple of '11'.
Only option(c) satisfied.

319. (d) Radius $= \frac{14}{2} = 7$ cm.
Total surface area of cylinder
$= 2\pi r(h + r)$

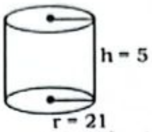
$= 2 \times \frac{22}{7} \times 7\ (9 + 7)$

$= 44 \times 16 = 704\ cm^2$

320. (b) r = 7 cm, h = 5 cm
Total surface Area of a cylinder
$= 2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times 7\ (7 + 5) = 44 \times 12 = 528\ cm^2$

321. (b)



Total surface area of cylinder

$= 2\pi r(r + h) = 2 \times \frac{22}{7} \times 21 \times (21 + 5)$

$= 2 \times 22 \times 3 \times 26 = 3432\ cm^2$

322. (b) Total surface area of cylinder
$= 2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times 15(27 + 15)$

$= \frac{44}{7} \times 15 \times 42 = 44 \times 90$

$= 3960\ cm^2$

Note:- Last step calculation can be done with the help of unit digit.

323. (a) Total surface area of cylinder = curved surface area of cylinder +

$2\pi r^2 = 352 + 2 \times \frac{22}{7} \times 7 \times 7$

$= 352 + 308 = 660\ cm^2$

324. (c) Curved surface area of cylinder = $2\pi rh$

$\Rightarrow 88 = 2 \times \frac{22}{7} \times r \times 14 \Rightarrow r = 1\ cm$

Total surface area of cylinder
= Curved surface area + $2\pi r^2$

$= 88 + 2 \times \frac{22}{7} \times 1$

$= 88 + \frac{44}{7} = \frac{660}{7}\ cm^2$

325. (a) Curved surface area of cylinder
$= 2\pi rh$

$\Rightarrow 2 \times \frac{22}{7} \times 7 \times h = 2200 \Rightarrow h = 50$

Total surface area of cylinder

$= 2\pi r(r + h) = 2 \times \frac{22}{7} \times 7(50 + 7)$

$= 44 \times 57 = 2508\ cm^2$

Note:- Choose option by unit digit.

Alternate Method:

Total Surface area of cylinder
= Curved Surface area + $2\pi r^2$

$= 2200 + 2 \times \frac{22}{7} \times 7 \times 7$

$= 2200 + 308 = 2508\ cm^2$

326. (a) ATQ, h = r
∴ T.S.A of cylinder $= 2\pi r\ (h + r)$
$\Rightarrow 2\pi r\ (r + r) = 64\pi$
$\Rightarrow r = h = 4$ units
Now ATQ,

$r = \frac{4}{2} = 2,\ h = 4 \times 2 = 8$

T.S.A of cylinder $= 2\pi r\ (h + r)$
$= 2\pi \times 2 \times (8 + 2) = 40\pi$

327. (c) h = 12 cm, $r = \frac{28}{2} = 14$ cm

$\frac{TSA}{CSA} = \frac{2\pi r(h + r)}{2\pi rh} = \frac{h + r}{h}$

$= \frac{12 + 14}{12} = \frac{26}{12} = \frac{13}{6}$

328. (a) R + h = 12.5
TSA of cylinder $= 2\pi R(R + h)$

$\Rightarrow 275 = 2 \times \frac{22}{7} \times R \times 12.5$

$\Rightarrow R = 3.5\ cm$

329. (c) Given,
r + h = 42
and $2\pi r(r + h) = 6336$

$\Rightarrow 2\pi r = \frac{6336}{42}$

$\Rightarrow r = \frac{6336 \times 7}{42 \times 22 \times 2} = 24$

∴ h = 42 – 24 = 18m
∴ Curved surface area of cylinder

$= 2\pi rh = 2 \times \frac{22}{7} \times 24 \times 18$

$= 2715.43\ m^2$

330. (c) Total Surface area of cylinder
$= 2\pi r(h + r)$
$= 2 \times 3.142 \times 1.5 \times (3 + 1.5)$
$= 2 \times 3.142 \times 1.5 \times 4.5 = 42.42\ m^2$

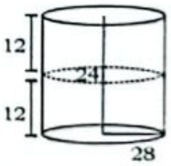
331. (c) Curved surface area of cylinder
$= 2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{35}{100} \times 6 = 44 \times \frac{30}{100}$

$= \frac{1320}{100} = 13.2\ m^2$

∴ Total cost = 13.2 × 50 = ₹660

332. (c)



Total surface area of cylinder $= 2\pi r(h + r)$
After bisecting increased area $= 2\pi r^2$

Increased% $= \frac{2\pi r^2}{2\pi r(h + r)} \times 100$

$= \frac{r}{h + r} \times 100$

$= \frac{28}{(28 + 24)} \times 100 = 53.85\%$

333. (c) Lateral surface area of cylinder : Total surface area of cylinder
$\Rightarrow 2\pi rh : 2\pi r(h + r) \Rightarrow h : h + r$
$\Rightarrow 10 : 10 + 30 \Rightarrow 1 : 4$

334. (c) Total surface area of cylinder
$= 2\pi r(h + r)$
ATQ,
$2\pi r\ (h + r) = 628$
$\Rightarrow 2 \times 3.14 \times 5 \times (h + 5) = 628$
$\Rightarrow h + 5 = 20 \Rightarrow h = 15\ m$
∴ Curved surface area of cylinder

$= 2\pi rh = 2 \times \frac{22}{7} \times 5 \times 15$

$= 471.42 m^2 \approx 470.8\ m^2$

335. (d) Difference between total surface area and curved surface area of cylinder $= (2\pi rh + 2\pi r^2) - 2\pi rh = 2\pi r^2$

$= 2 \times \frac{22}{7} \times 14 \times 14 = 1232\ cm^2$

336. (a) Capacity of cylindrical tank = πr^2h

$= \frac{22}{7} \times 2.1 \times 2.1 \times 6.3$

$= 22 \times 4.41 \times 0.9 = 87.318\ m^3$

$= 87318$ liter.

337. (a) Volume of cylinder = πr^2h

$= 3.14 \times 10 \times 10 \times 20 = 6280\ cm^3$

338. (b) Volume of cylinder = πr^2h

$= \frac{22}{7} \times 8 \times 8 \times 14$

$= 22 \times 64 \times 2 = 2816\ cm^3$

339. (c) Volume of cylinder = Area of base × Height

$= 20 \times 8 = 160\ cm^3$

340. (c) Circumference of the base of a cylindrical vassel = $2\pi r$

$\Rightarrow 44 = 2\pi r \Rightarrow r = 7$ cm

Volume of cylinder = πr^2h

$= \frac{22}{7} \times 7 \times 7 \times 25$

$= 154 \times 25 = 3850\ cm^3$

$(1\ cm^3 = \frac{1}{1000}$ liter)

$\therefore 3850\ cm^3 = 3.85$ litre

341. (d) Volume of cylinder = πr^2h

$\Rightarrow 448 = \pi \times \left(\frac{8}{\pi}\right)^2 \times h$

$\Rightarrow 448 = \frac{64}{\pi} \times h$

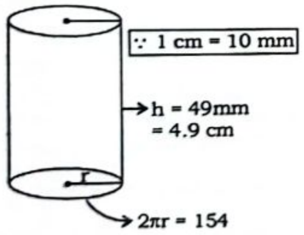
$\Rightarrow h = \frac{448 \times 22}{64 \times 7} = 22$ cm

342. (d) Volume of right circular box = πr^2h

$\Rightarrow 600 = \frac{22}{7} \times 30 \times 30 \times h$

$\Rightarrow h = 0.21$ cm

343. (a)



$r = \frac{49}{2}$

Volume of cylinder = πr^2h

$= \frac{22}{7} \times \frac{49}{2} \times \frac{49}{2} \times 4.9$

$= 9243.85 - 9244\ cm^3$

$= 9.244$ litre $(1\ cm = \frac{1}{1000}$ liter)

344. (b) Capacity of circular tank = πr^2h

$\Rightarrow 8316 = \frac{22}{7} \times 21 \times 21 \times h$

$\Rightarrow h = \frac{8316 \times 7}{22 \times 441} = 6$

$\therefore$ Depth of tank = 6 cm.

345. (c) Diameter = 12 cm, radius = 6

Amount of water she can carry (Volume of cylindrical flask)

$= \pi r^2h = \frac{22}{7} \times 6 \times 6 \times 21 = 2376\ cm^3$

Note:- Answer will be multiple of 11. only option (c) satisfy)

346. (a) $h = 2r = 2 \times 4 = 8$

$r = 4$

$\therefore$ Volume = $\pi r^2h = \pi \times 4^2 \times 8 = 128\pi$

347. (c) Surface area of base $(\pi r^2) = 78\frac{4}{7}$

$= \frac{550}{7}\ m^2$

Volume of cylinder = $1650m^3$

$\Rightarrow \pi r^2h = 1650$

$\Rightarrow \frac{550}{7} \times h = 1650 \Rightarrow h = 21$m

348. (a) $r = 5h = 5 \times 3.5$

Volume of cylinder = πr^2h

$= \frac{22}{7} \times 5 \times 3.5 \times 5 \times 3.5 \times 3.5$

$= 3368.75\ cm^3$

Note:- Without doing complete calculation, Check which option is multiple of '11'.

Only Option (a) Satisfied.

349. (c) h = 14 cm

$r = 4h = 4 \times 14 = 56$ cm

Volume of cylinder = πr^2h

$= \frac{22}{7} \times 56 \times 56 \times 14 = 22 \times 112 \times 56$

$= 137984\ cm^3$

Note:- Without doing complete calculation, Using concept of unit digit.

Only Option (c) Satisfied.

350. (d) ATQ, $2\pi r = r + 37$

$\Rightarrow \left(\frac{44}{7} - 1\right)r = 37$

$\Rightarrow \left(\frac{37}{7}\right)r = 37 \Rightarrow r = 7$

Volume of cylinder = πr^2h

$= \frac{22}{7} \times 7 \times 7 \times 35 = 5390\ cm^3$

> **SMART APPROACH:-**
>
> Volume of Cylinder must be multiple of '**11**'.
> Only Option (d) Satisfied.

351. (a) Given,

Volume of cylinder $(\pi r^2h) = 2002\ cm^3$

h = 13cm

area of base = πr^2

ATQ,

$\pi r^2h = 2002$

$\Rightarrow \pi r^2 = \frac{2002}{13} = 154\ cm^2$

352. (d) Given,

CSA of cylinder $(2\pi rh) = 88$ ...(i)

Volume of cylinder $(\pi r^2h) = 132$ ...(ii)

$\frac{\pi r^2h}{2\pi rh} = \frac{132}{88}$

$\Rightarrow r = \frac{132}{88} \times 2 = 3$

CSA of cylinder $(2\pi rh) = 88$

$\Rightarrow 2 \times \frac{22}{7} \times 3 \times h = 88$

$\Rightarrow h = \frac{14}{3} = 4\frac{2}{3}$cm

353. (c) Given, height of a cylinder = 10 cm

C.S.A. of cylinder = $1320\ cm^2$

$\Rightarrow 2\pi rh = 1320$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 10 = 1320 \Rightarrow r = 21$

$\therefore$ Volume of cylinder

$= \pi r^2h = \frac{22}{7} \times 21 \times 21 \times 10 = 13860\ cm^3$

$= 0.01386\ m^3$

354. (d) Radius of pillar = 11 m.

Height of pillar = 21 m.

Volume of Cylinder = πr^2 h.

$= \frac{22}{7} \times 11 \times 11 \times 21 = 7986\ m^3$

Note:- Answer must be multiple of 11. only option (d) satisfy.

355. (c) Curved surface area of cylinder = $2\pi rh$

$\Rightarrow 2 \times \frac{22}{7} \times 7 \times h = 396 \Rightarrow h = 9$

$\therefore$ Volume of cylinder = πr^2h

$= \frac{22}{7} \times 7 \times 7 \times 9 = 22 \times 63 = 1386\ cm^2$

Note:- Choose option by multiple of 9.

356. (d) $2\pi r = 62.8$

$r = \frac{62.8}{2 \times 3.14} = 10$ cm

Volume of Cylinder = πr^2h

$\Rightarrow 8792 = 3.14 \times 10 \times 10 \times h$

$\Rightarrow h = 28$ cm

So, curved surface area of the cylinder = $2\pi rh$

$= 2 \times 3.14 \times 10 \times 28$

$= 1758.4\ cm^2$

Note:- Without doing complete calculation, Check which option has unit digit '4'.

Only Option(d) Satisfied.

357. (d) h = 20 cm and

Curved surface area of cylinder $(2\pi rh) = 1760$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 20 = 1760$

$\Rightarrow r = \frac{1760 \times 7}{20 \times 2 \times 22} = 14$ cm

Volume of cylinder = πr^2h

$= \frac{22}{7} \times 14 \times 14 \times 20$

$= 22 \times 2 \times 14 \times 20 = 12320$

By unit digit ⇒ '0'

only option (d) has unit digit '0'.

358. (d) C.S.A of cylinder = $2\pi rh$

$\Rightarrow 660 = 2\pi rh$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 15 = 660 \Rightarrow r = 7$

$\therefore$ Volume of cylinder = $\frac{22}{7} \times 7 \times 7 \times 15$

$= 22 \times 7 \times 15$

$= 11 \times 210 = 2310\ cm^3$

Note:- Answer must be a multiple of 11. Only option (d) satisfy.

359. (c) ATQ,

$2\pi rh + 2\pi rh + 2\pi r^2 = 2068$

$= 2\pi rh + 2\pi r\ (h + r) = 2068$

$\Rightarrow 2\pi r\ (2h + r) = 2068$

$\Rightarrow 2 \times \frac{22}{7} \times 7\ (2h + 7) = 2068$

$\Rightarrow h = 20$

$\therefore$ Volume of cylinder = πr^2h

$= \frac{22}{7} \times 7 \times 7 \times 20 = 3080\ cm^3$

360. (d) $r = 10.5,\ 2\pi rh = 792\ cm^2$

$\Rightarrow \pi rh = 396$

$V = \pi r^2h = \pi rh \times r = 396 \times 10.5$

$= 4158\ cm^3$

361. (d) Volume of tank = πr^2h

$\Rightarrow 0.616 = \frac{22}{7} \times 0.14 \times 0.14 \times h$

$\Rightarrow h = 10$ m

∴ Water level in tank is dropped by 10 m

Alternate Method:-

∵ 1 liter = 1000 cm^3

Volume of tank (Cylinder) = πr^2h

$616 \times 1000 = \frac{22}{7} \times 14 \times 14 \times h$

h = 1000 cm $\boxed{\because 100 \text{ cm} = 1 \text{ m}}$

∴ h = 10 m

∴ Water level in tank is dropped by 10 m

362. (a)

$$\frac{\text{Curved Surface Area of bigger Cylinder}}{\text{Curved Surface Area of smaller Cylinder}}$$

$= \frac{350}{100} = \frac{7}{2}$

$\Rightarrow \frac{2\pi RH}{2\pi rh} = \frac{7}{2} \Rightarrow \frac{3\times H}{1\times h} = \frac{7}{2}$

$\Rightarrow \frac{H}{h} = \frac{7}{6}$

$\therefore \frac{\text{Volume of smaller cylinder}}{\text{Volume of bigger cylinder}}$

$= \frac{\pi r^2h}{\pi R^2H} = \frac{1\times 6}{3\times 3\times 7} = \frac{2}{21}$

∴ Required % = $\frac{2}{21} \times 100 = 9.52\%$

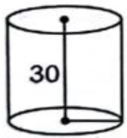
363. (d) Volume of cylindrical cup = πr^2h

$= \frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times 4 = 22 \times 7 = 154 \text{ cm}^3$

= 0.154 litre $\boxed{\because 1l = 1000 \text{ cm}^3}$

To serve 180 patients, Quantity of tea = 0.154 × 180 = 27.72 litre

364. (b)



Required T.S.A of painting solid right circular cylinder at the rate of ₹ 25/

$m^2 = \frac{18425}{25} = 737 \text{ m}^2$

$\Rightarrow 2\pi r(r + h) = 737$

$\Rightarrow 2 \times \frac{22}{7} \times r\,(r + 30) = 737$

$\Rightarrow r(30 + r) = \frac{67\times 7}{4} = \frac{7}{2}\times\frac{67}{2}$

$\Rightarrow r(30 + r) = \frac{7}{2}\left(30 + \frac{7}{2}\right) \Rightarrow r = \frac{7}{2}$

∴ Volume of cylinder = πr^2h

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 30$

$= 11 \times 7 \times 15 = 1155 \text{ m}^3$

Note:- By digital sum,

DS = 2 × 7 × 6 = 3

DS of 1155 = 3

365. (d) Given,

Speed of flowing water = 18 km/h

Diameter of canal = 7 m

Radius of canal = $\frac{7}{2}$m

Distance covered in 30 minutes (9 km) will be considered as height.

h = 9000 m

Volume of water flowing through the canal in 30 minutes.

$= \pi r^2h$

$= \frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times 9000 = 346500 \text{m}^3$

Note:- Answer must be multiple of 9. only option (d) satisfy.

366. (d) Depth of River = 6 m

Width of River = 35 m

Rate of Flow = 2.5 km/h

Volume of water flowing = Depth × Width × Rate of flow.

So, volume of water flowing in to sea per minute.

$= 6 \times 35 \times \frac{25}{10} \times \frac{5}{18} \times 60 = 8750 \text{ m}^3$

Note:- Without doing complete calculation, Check which option is multiple of '7'.

Only Option(d) Satisfied.

367. (b) $r_1 : r_2 = 2 : 1$

$h_1 : h_2 = 5 : 2$

$\frac{v_1}{v_2} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \frac{(2)^2 \times 5}{(1)^2 \times 2} = \frac{10}{1}$

$v_1 : v_2 = 10 : 1$

368. (b) Given,

$\frac{V_1}{V_2} = \frac{13}{1}$ and $\frac{H_1}{H_2} = \frac{13}{9}$

Also, $\pi r_2^2 = 154 \Rightarrow r_2 = 7$

Consider,

$\frac{V_1}{V_2} = \frac{\pi r_1^2 H_1}{\pi r_2^2 H_2} \Rightarrow \frac{13}{1} = \frac{r_1^2}{7^2} \times \frac{13}{9}$

$\Rightarrow r_1 = 21$ cm

369. (d) Ratio of volumes of two cylinders = 6 : 1

Ratio of their height = 1 : 6

Ratio of radii = $r_1 : r_2$

$\frac{\pi r_1^2 \times h_1}{\pi r_2^2 \times h_2} = \frac{v_1}{v_2} \Rightarrow \frac{r_1^2}{r_2^2} \times \frac{1}{6} = \frac{6}{1}$

$\Rightarrow \frac{r_1^2}{r^2} = \frac{36}{1} \Rightarrow r_1 : r_2 = 6 : 1$

370. (c) $\frac{V_1}{V_2} = \frac{32}{9} \Rightarrow \frac{\pi R_1^2 h_1}{\pi R_2^2 h_2} = \frac{32}{9}$

$\Rightarrow \frac{\pi R_1^2}{616} \times \frac{8}{9} = \frac{32}{9}$

$\Rightarrow \frac{\pi R_1^2}{616} = 4 \Rightarrow R_1^2 = \frac{4 \times 616 \times 7}{22}$

$\Rightarrow R_1 = 2 \times 7 \times 2 = 28$ cm

371. (d) Given,

r = 4m

ATQ,

$3[2 \times \pi r^2] = 2 \times 2\pi rh$

$\Rightarrow 6\pi r^2 = 4\pi rh$

$\Rightarrow \frac{r}{h} = \frac{2}{3}$

⇒ r (2 unit) → 4 m

⇒ h (3 unit) → 6 m

∴ Volume of cylinder = πr^2h

$= \pi \times 4 \times 4 \times 6 = 96\pi \text{ m}^3$ or 96π kiloliter

372. (d) Given,

Volume of cylinder (πr^2h) = 4312 cm^3

ATQ,

$2\pi rh = \frac{1}{3} \times 2\pi r\,(r + h)$

$\Rightarrow h = \frac{r + h}{3} \Rightarrow 3h = r + h$

$\Rightarrow \frac{h}{r} = \frac{1}{2}$

Then, Volume of cylinder = πr^2h

$\Rightarrow \frac{22}{7} \times 2x \times 2x \times 1x = 4312$

$\Rightarrow x^3 = \frac{4312 \times 7}{22 \times 4} = 343$

$\Rightarrow x = 7$

$\Rightarrow r = 14, h = 7$

C.S.A. of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 14 \times 7$

$= 616 \text{ cm}^2$

373. (b) CSA of cylinder ($2\pi rh$) = 462 cm^2

Base area of cylinder (πr^2) = 346.5 cm^2

Then,

$\Rightarrow \pi r^2 = 346.5$

$\Rightarrow \frac{22}{7} \times r^2 = 346.5$

$\Rightarrow r^2 = 110.25$

$\Rightarrow r = 10.5$ cm

$2\pi rh = 462$

$\Rightarrow 2 \times \frac{22}{7} \times 10.5 \times h = 462$

$\Rightarrow h = 7$ cm

Volume of cylinder = πr^2h

$= \frac{22}{7} \times 10.5 \times 10.5 \times 7 = 2425.5 \text{ cm}^3$

Note:- We can get answer by option which option is multiple of 11. option (b) is correct.

374. (c) Both cylinders capacity (volume) equal.

$2r_1 : 2r_2 = 1 : 4$

$\Rightarrow r_1 : r_2 = 1 : 4$

$\because \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \frac{1}{1}$

$\Rightarrow \frac{h_1}{h_2} = \frac{r_2^2}{r_1^2} = \left(\frac{4}{1}\right)^2 = \frac{16}{1}$

$\Rightarrow h_1 : h_2 = 16 : 1$

375. (d) ATQ,

$2(2\pi rh) = \pi r^2h$

$\Rightarrow r = 4$

376. (b) Diameter = 1 mm

Radius = 0.5 mm = $\frac{5}{100}$ cm

$\Rightarrow \pi r^2h = 110$

$\Rightarrow \frac{22}{7} \times \left(\frac{5}{100}\right)^2 \times h = 110 \Rightarrow h = 14000$

Each chain requires 56 cm length of wire = $\frac{14000}{56} = 250$

∴ There are 250 gold chains made.

377. (b) $\frac{\text{Curved surface area of cylinder}}{\text{Volume of cylinder}}$

$= \frac{2\pi rh}{\pi r^2h} \Rightarrow \frac{2}{3} = \frac{2\pi rh}{\pi r^2h}$

$\Rightarrow \frac{1}{r} = \frac{1}{3} \Rightarrow r = 3$

(Given,)r : h = 3 : 7 ⇒ h = 7

∴ Total suface area of cylinder

$= 2\pi r(h + r)$

$= 2 \times \pi \times 3 \times (3 + 7)$

$= 2\pi \times 3 \times 10$

$= 60\pi \text{ unit}^2$

378. (a) Given,
Ratio of height and base radius = 7 : 5
Volume of cylinder = πr^2h
$\Rightarrow 14836.5 = 3.14 \times (5x)^2 \times 7x$
$\Rightarrow x^3 = \frac{14836.5}{3.14 \times 25 \times 7} = 27$
$\Rightarrow x = 3$
Hence, height = 21 cm and base radius = 15 cm
$\therefore$ Total surface area = $2\pi r(r + h)$
$= 2 \times 3.14 \times 15(15 + 21)$
$= 2 \times 3.14 \times 15 \times 36 = 3391.2$ cm²
Note: Use digital sum for calculation 9 is a factor of $2 \times 3.14 \times 15 \times 36$ then answer is divisible by 9.
Only option (a) is divisible by '9'

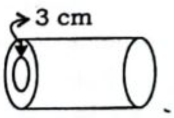
379. (b) Volume of cylinder = πr^2h
$\Rightarrow 792 = \frac{22}{7} \times 6x \times 6x \times 7x$
$\Rightarrow x^3 = \frac{792}{22 \times 36}$
$\Rightarrow x = 1$
$\therefore$ Curved surface area of cylinder = $2\pi rh$
$= 2 \times \frac{22}{7} \times 6 \times 7 = 264$ cm²

SMART APPROACH:-
Curved surface area of cylinder must be multiple of 6. Only 264 is multiple of 6.
Option (b) is correct.

380. (c) Since the jugs are similar therefore ratio of their radii will same as the ratio of their heights.
Ratio of height of smaller jug to that of larger jug = 8 : 12 = 2 : 3
So,
$\frac{\text{Capacity of smaller jug}}{\text{Capacity of larger jug}} = \left(\frac{2}{3}\right)^3$
$\Rightarrow \frac{80}{\text{Capacity of larger jug}} = \frac{8}{27}$
$\Rightarrow$ Capacity of larger jug
$= \frac{27}{8} \times 80 = 270$ cm³

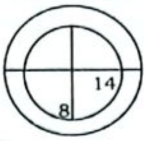
381. (b) R = 10 cm.
Thickness = 1 cm
Inner radius (r) = 10 – 1 = 9 cm.
Surface area of hollow cylinder = $2\pi Rh + 2\pi rh + 2\pi(R^2 - r^2)$
$= 2\pi[Rh + rh + R^2 - r^2]$
$= 2\pi[(r + R)(h + R - r)]$
$= 2 \times \frac{22}{7}[19(13)] = 1552.57$ cm²

382. (c)



Given,
R = 10 cm,
h = 49 cm
r = 10 – 3 = 7 cm
Volume of plastic = $\pi h[R^2 - r^2]$
$= \frac{22}{7} \times 49[10^2 - 7^2] = 154 \times 3 \times 17$
$= 7854$ cm³

383. (b)



R = 7, r = 4
$\Rightarrow V = \pi(R^2 - r^2)h$
$\Rightarrow V = \frac{22}{7}(7^2 - 4^2) \times 42$
$= \frac{22}{7} \times 11 \times 3 \times 42 = 4356$
Note:- It can be done with the help of unit digit.

384. (a) ATQ,
$\pi r^2h = \frac{88}{7}$
$\Rightarrow \frac{22}{7} \times r^2 \times 1 = \frac{88}{7} \Rightarrow r = 2$
$\because R = 4$
Volume of Material = $\pi(R^2 - r^2) \times h$
$= \frac{22}{7} \times (16 - 4) \times 1$
$= \frac{22}{7} \times 12 \times 1 = 37.7$ unit³

385. (c) Given,
h = 2m = 200 cm
R = 4
r = 4 – 0.5 = 3.5
Volume = $\pi \times h[R^2 - r^2]$
$= \pi \times 200[4^2 - 3.5^2]$
$= \pi \times 200 \times 3.75 = 750\pi$ cm³

386. (c) C.S.A of cone = πrl
$l = \sqrt{3^2 + 4^2} = 5$
C.S.A of cone = $\pi \times 3 \times 5 = 15\pi$

SMART APPROACH:-
After calculating 'l', find the multiple of 'l' value's in the option.

387. (c) Given,
r = 7 cm, l = 10 cm
C.S.A of cone = πrl
$= \frac{22}{7} \times 7 \times 10 = 220$ cm²

388. (d) Circumference of the base of a conical tent ($2\pi r$) = 32πm
$\therefore$ r = 16m
h = 8m
$\therefore l = \sqrt{h^2 + r^2} = \sqrt{8^2 + 16^2}$
$= \sqrt{64 + 256} = \sqrt{320} = 8\sqrt{5}$ m
Curved surface area of conical tent = πrl
$= \pi \times 16 \times 8\sqrt{5} = 128\sqrt{5}\,\pi$ m²

389.(a) r = 9 cm, l = 49 cm
C.S.A = $\pi rl = \frac{22}{7} \times 9 \times 49$
$= 22 \times 9 \times 7$
Using unit digit = '6'
Option (a) 1386 cm²

390. (d) Curved surface area of cone = πrl
$\Rightarrow 2200 = \frac{22}{7} \times 28 \times l$
$\Rightarrow l = 25$ cm
$\therefore$ Slant height of cone = 25 cm

391. (b) Curved surface area of cone = πrl
$\Rightarrow \pi rl = 308$
$\Rightarrow \frac{22}{7} \times 28 \times r = 308 \Rightarrow r = 3.5$ cm

392. (b) Circumference of conical tent = $2\pi r$
$\Rightarrow 2\pi r = 30\pi$
$\Rightarrow r = 15;\ h = 20$
$\Rightarrow l = 25$ [3, 4, 5 triplet multiply with 5]
Curved surface area of cone = πrl
$= \pi \times 15 \times 25 = 375\pi$

393. (a) Curved surface area of cone = πrl
$\Rightarrow \frac{22}{7} \times 4.2 \times r = 13.2 \Rightarrow r = 1$ unit

394. (c) Slant height (l) = $4x$
Height (h) = $3x$
Radius (r) = $\sqrt{7}x$
$[\because r = \sqrt{(l^2 - h^2)}]$
C.S.A. of cone = πrl
$4\sqrt{7}\pi = \pi \times \sqrt{7}x \times 4x$
$\Rightarrow x^2 = 1$
$\Rightarrow x = 1$
$\therefore r = \sqrt{7}x = \sqrt{7}$

395. (d) $\because$ Curve Surface area of cone = πrl
$\Rightarrow \pi rl = 396$
$\Rightarrow \frac{22}{7} \times \frac{21}{2} \times l = 396$
$\Rightarrow$ Slant height (l) = 12 cm

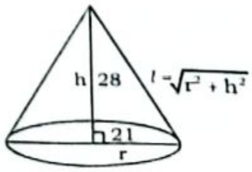
396. (b) C.S.A of cone (πrl) = 990
$\Rightarrow \frac{22}{7} \times 21 \times l = 990 \Rightarrow l = 15$ cm

397. (d) Given,
h = 10 m & r = $\frac{48}{2}$ = 24 m
$l = \sqrt{h^2 + r^2} = \sqrt{(10)^2 + (24)^2}$
$= \sqrt{100 + 576} = \sqrt{676} = 26$
C.S.A of Tent = πrl
$= \pi \times 24 \times 26 = 624\pi$
Note:- It can be done with the help of unit digit.

398. (a) r = 6, h = 8
$l = \sqrt{h^2 + r^2} = \sqrt{8^2 + 6^2} = 10$
Canvas needed to make the tent = πrl
$= \frac{22}{7} \times 6 \times 10 = \frac{1320}{7}$
= 188.57 sq. units

399. (a) $l = \sqrt{4.2^2 + 1.75^2}$
$= \sqrt{17.64 + 3.0625} = \sqrt{20.7025}$
= 4.55
Curved surface area of cone = πrl
$= \frac{22}{7} \times 4.2 \times 4.55 = 60.06$ m²

400. (b) Area of conical tank = πrl



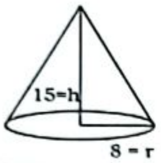
Given, Width of cloth = 5 m
$r = 21$ m, $h = 28$ m,

Now, $l = \sqrt{r^2 + h^2} = \sqrt{21^2 + 28^2} = 35$ m
Curved Surface Area of Cone = $\pi r l$ =
$\frac{22}{7} \times 21 \times 35 = 105 \times 22$ m

Required length of cloth = $\frac{105 \times 22}{5}$
$= 21 \times 22 = 462$ m

401. (b) Slant height (l) = $6\sqrt{3}$ cm,
ATQ, $\frac{\pi r l}{\pi r^2} = \frac{2}{1} \Rightarrow \frac{l}{r} = \frac{2}{1}$
l (2 unit) = $6\sqrt{3}$
r (1 unit) = $3\sqrt{3}$
$h = \sqrt{l^2 - r^2} = \sqrt{108 - 27} = 9$ cm

402. (b)



$l = \sqrt{h^2 + r^2} = \sqrt{225 + 64}$
$= \sqrt{289} = 17$ m.
Note:-By triplet of 8, 15, 17
$\Rightarrow l = 17$ m
$\therefore$ Area of material used = πrl
$= \pi \times 8 \times 17 = 136\pi m^2$
$\therefore$ Cost = 54×136 = ₹ 7344
Note: To avoid calculation use digital sum method.

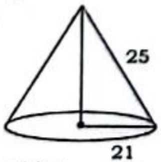
403. (b) Given,
$2\pi R = 88 \Rightarrow R = \frac{88 \times 7}{44} = 14$ cm
$l = \sqrt{R^2 + h^2} = \sqrt{14^2 + 28^2} = 14\sqrt{5}$ cm
C.S.A. of cone = $\pi R l$
$= \frac{22}{7} \times 14 \times 14\sqrt{5} = 616\sqrt{5}$ cm^2.

404. (c) C.S.A of cone = 594 cm^2
$\Rightarrow \pi r l = 594$
$\Rightarrow \frac{22}{7} \times 21 \times l = 594 \Rightarrow l = 9$

405. (d) Slant height (l) = 11 cm
radius (r) = 6 cm
$\therefore$ C.S.A of a cone = $\pi r l$
$= 6 \times 11 \times \pi = 66\pi$ cm^2

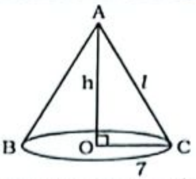
406. (a) $l = 20$ cm
$\because \pi r^2 = 616$ cm$^2 \Rightarrow r = 14$ cm
C.S.A of cone = $\pi r l$
$= \frac{22}{7} \times 14 \times 20 = 880$ cm^2

407. (a)



Consider,
C.S.A of cone = $\pi r l = \frac{22}{7} \times 21 \times 25$
$= 66 \times 25 = 1650$
$\therefore$ Cost of painting = 1.5×1650
= ₹2475

408. (b)



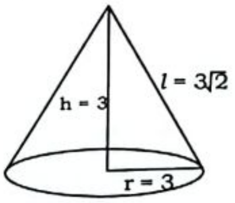
T.S.A of cone = $\pi r l + \pi r^2 = 550 + \pi r^2$
$= 550 + \frac{22}{7} \times 7 \times 7$
$= 550 + 154 = 704$ cm^2

409. (b) Total surface area of cone = $\pi R(R + L)$
Given, $R = \frac{r}{4}$, $L = 4l$
ATQ,
$\Rightarrow \pi R(R + L) = \pi \times \frac{r}{4}\left(\frac{r}{4} + 4l\right)$
$= \frac{\pi r}{4} \times 4\left(\frac{r}{16} + l\right) = \pi r\left(\frac{r}{16} + l\right)$

410. (d) $r = 3.5$, $h = 18$
Volume of cone = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 18 = 231$ cm^3

411. (a) $\therefore$ Volume of cone = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 7 = 264$ cm^3

412. (d)



Volume of cone = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi \times 3 \times 3 \times 3 = 9\pi$ units^3

413.(b) Volume of cone = $\frac{1}{3}\pi r^2 h$
$\Rightarrow 46200 = \frac{1}{3} \times \frac{22}{7} \times 70 \times 70 \times h$
$\Rightarrow h = 9$
$\therefore$ Height of cone = 9m

414. (c) Volume of cone = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 10.5 \times 10.5 \times 24$
$= 22 \times 12 \times 10.5 = 2772$ cm^3

415. (b) Height of cone = $\sqrt{10^2 - 6^2} = 8$ cm.
Volume of cone = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \pi \times 6 \times 6 \times 8 = 96\pi$ cm^3

416. (a) Volume of cone = $\frac{1}{3}\pi r^2 h$
$\Rightarrow \frac{1}{3}\pi r^2 \times 18 = 150\pi$
$\Rightarrow r = 5, h = 18$
$l = \sqrt{18^2 + 5^2} = \sqrt{324 + 25}$
$= \sqrt{349} \sim 18.68$

417. (a) Volume of water tank = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 9 = 22 \times 21$
= 462 cubic feet
Note:- It can be done with the help of unit digit.

418. (d) Curved surface area of cone = $\pi r l$
$\Rightarrow 20\pi = \pi \times 4 \times l \Rightarrow l = 5$
By triplet of 3, 4, 5
Height = 3 cm
Volume of cone
$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 4 \times 4 \times 3 = 16\pi$cm^3

419. (c) Volume of cone = $\frac{1}{3} \times \pi r^2 h$
$= \frac{1}{3} \times \pi \times (2r)^2 \times h = \frac{1}{3}\pi r^2 h \times 4$
$= 400 \times 4 = 1600$

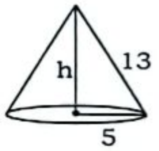
SMART APPROACH:-

Since Height (h) constant

radius →	r^2	:	$(2r)^2$
	1	:	4
Volume →	400	:	4×400
	400	:	1600

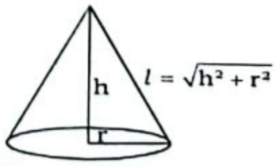
420. (d) Given, $r = 7$ cm, $V = 196\pi$ cm^3
Then,
$\Rightarrow \frac{1}{3}\pi r^2 h = 196\pi$
$\Rightarrow \frac{1}{3} \times 7 \times 7 \times h = 196$
$\Rightarrow h = 12$ cm

421. (a)



Given,
$r = 5$ cm, $l = 13$ cm
$h = 12$cm (Pythagorean triplet)
Volume of cone = $\frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12$
$= \frac{22}{7} \times 5 \times 20 = \frac{2200}{7} = 314.3$ cm^3

422. (d) Let,
$h = 12x$, $r = 5x$
Volume of cone = $\frac{1}{3}\pi r^2 h$
$\Rightarrow \frac{1}{3} \times 3.14 \times 5 \times 5 \times 12 \times x^3 = 314$
$\Rightarrow x^3 = \frac{100 \times 3}{5 \times 5 \times 12} = 1$
$\Rightarrow x = 1$
$\therefore r = 5, h = 12$



Hence, $l = 13$

423. (a) Area of base = 15 × 5 = 75 m²
$\because \pi r^2 = 75$
Volume of cone = 15 × 30 = 450 m³
$\frac{1}{3}\pi r^2h = 450\text{m}^3$
$\Rightarrow \frac{1}{3} \times 75 \times h = 450$
$\Rightarrow \frac{h}{3} = 6 \Rightarrow h = 18$ m

424. (c) Radius (r) = $\frac{70}{2}$ = 35 cm
C.S.A. of cone = πrl
$\Rightarrow 4070 = \frac{22}{7} \times 35 \times l$
$\Rightarrow l = 37$ cm
$\because \; l^2 = h^2 + r^2$
$\Rightarrow h^2 = (37)^2 - (35)^2 = 72 \times 2$
$\Rightarrow h = 12$ cm
Note:- By triplet of 12, 35, 37.
$\Rightarrow h = 12$ cm
Volume of cone = $\frac{1}{3}\pi r^2h$
$= \frac{1}{3} \times \frac{22}{7} \times 35 \times 35 \times 12$
= 15400 cm³

425. (b) $2\pi r = 42\pi$
$\Rightarrow r = 21$ cm
Volume of cone = $\frac{1}{3}\pi r^2h$
$= \frac{1}{3} \times \frac{22}{7} \times 21 \times 21 \times 24 = 11088 \text{ cm}^3$
Note: With the help of unit digit, only option (b) satisfy.

426. (d) Slant height = 5 cm
ATQ, h = r (Given)
$l = \sqrt{r^2 + h^2} = \sqrt{r^2 + r^2} = \sqrt{2}r$
$r = \frac{l}{\sqrt{2}} = \frac{5}{\sqrt{2}}$
Volume of cone = $\frac{1}{3}\pi r^2h$
$= \frac{1}{3}\pi \times \left(\frac{5}{\sqrt{2}}\right)^3 = \frac{125\pi}{6\sqrt{2}} \text{ cm}^3$

427. (d) Volume of conical vessel = $\frac{1}{3}\pi r^2h$
$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 15 = 770 \text{ cm}^3$
∴ Weight of vessel = 770 × 15
= 11550 g = 11.55 kg

428. (b) Curved surface area of cone = πrl
$\Rightarrow \pi rl = 20\pi$
$\Rightarrow 4 \times l = 20$
$\Rightarrow l = 5$
$r = 4 \Rightarrow h = 3$ (By Pythagoras theorem)
∴ Volume of conical vessel
$= \frac{1}{3} \times \pi r^2h = \frac{1}{3} \times \pi \times 16 \times 3 = 16\pi \text{ cm}^3$

429. (c) $h_1 : h_2 = 1 : 5$
$P_1 : P_2 = 5 : 3$
$r_1 : r_2 = P_1 : P_2 = 5 : 3$
$\frac{V_1}{V_2} = \frac{r_1^2h_1}{r_2^2h_2}$
$= \frac{25 \times 1}{9 \times 5} = \frac{5}{9}$
∴ Ratio of their volume = 5 : 9

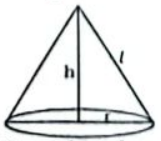
430. (a) Volume of cone = $\frac{1}{3}\pi r^2h$
$\frac{\text{Volume of cone 1}}{\text{Volume of cone 2}} = \frac{\frac{1}{3}\pi r_1^2h_1}{\frac{1}{3}\pi r_2^2h_2}$
$\Rightarrow \frac{3}{5} = \frac{2^2}{5^2} \times \frac{h_1}{h_2} \Rightarrow \frac{3}{5} = \frac{4h_1}{25h_2}$
$\Rightarrow \frac{h_1}{h_2} = \frac{15}{4}$
$\therefore h_1 : h_2 = 15 : 4$

431. (c) Volume of cone = $\frac{1}{3}\pi r^2h$
Volume of cone depends upon r² and h.
20% = $\frac{1}{5}$; 25% = $\frac{1}{4}$
5 6
5 6
4 3
100 108
8% volume increase

432. (a) Given that,
$\frac{V_1}{V_2} = \frac{11}{16}$ and $\frac{r_1}{r_2} = \frac{3}{4}$
$\Rightarrow \left[\frac{r_1^2}{r_2^2} = \frac{9}{16}\right]$
A.T.Q,
$\frac{\cancel{1/3}\pi r_1^2h_1}{\cancel{1/3}\pi r_2^2h_2} = \frac{11}{16} \Rightarrow \frac{9}{16} \times \frac{h_1}{h_2} = \frac{11}{16}$
$\Rightarrow \frac{h_1}{h_2} = \frac{11}{9} = 11 : 9$

433. (b) Given,
Volume of cone = 4838.4π cm³
$l : r = 29 : 20$
Let, $l = 29x$, $r = 20x$
$h = \sqrt{(29x)^2 - (20x)^2} = \sqrt{441x^2} = 21x$
Volume of cone = $\frac{1}{3}\pi r^2h$
$\Rightarrow 4838.4\pi = \frac{1}{3} \times \pi \times (20x)^2 \times 21x$
$\Rightarrow x^3 = \frac{691.2}{400} = \frac{1728}{1000}$
$\Rightarrow x = \sqrt[3]{\frac{1728}{1000}} = \frac{12}{10} = 1.2$
∴ Radius = 20 × 1.2 = 24cm

434. (a) Given,
$r = \frac{56}{2} = 28$ cm



Curved surface area of cone
= 3080 cm²
$\pi rl = 3080$
$\frac{22}{7} \times 28 \times l = 3080$
$l = 35$ cm
$h = \sqrt{l^2 - r^2} = \sqrt{35^2 - 28^2} = 21$ cm

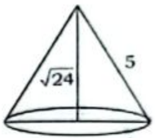
Volume of cone = $\frac{1}{3}\pi r^2h$
$= \frac{1}{3} \times \frac{22}{7} \times 28 \times 28 \times 21 = 17248 \text{ cm}^3$
Note: Radius divisible by 4 then option also divisible by 4 only option (a) divisible by 4, hence, answer will be option (a) satisfy.

435. (a) Volume of Cone = $\frac{1}{3} \times \pi \times 6^2 \times 5$
$= \frac{1}{3} \times \frac{22}{7} \times 36 \times 5 = 188.57 \text{ cm}^3$

Alternate Method:

Volume of Cone = $\frac{1}{3} \times \pi \times 6^2 \times 5$
Now use Approximation method solved
$= \frac{21}{21} \times 180 = 1 \times 180 \sim 188.57\text{cm}^3$

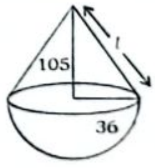
436. (d)



L.S.A. of cone = $\overset{1}{5}$ × B − A
$\pi rl = 5 \times \pi r^2$
$\frac{l}{r} = \frac{5}{1}$
$l : r : h = 5x : 1x : \sqrt{24}x$
$\sqrt{24}x = 63 \Rightarrow x = \frac{63}{\sqrt{24}}$
Volume = $\frac{1}{3} \times \frac{22}{7} \times x^2 \times \sqrt{24}x$
$= \frac{1}{3} \times \frac{22}{7} \times \frac{63 \times 63}{24} \times 63 = 10914.75$
Note: Use digital sum method to avoid calculation.

SMART APPROACH:-
Use Divisibility by 11
Only option (d) satisfy

437. (b)



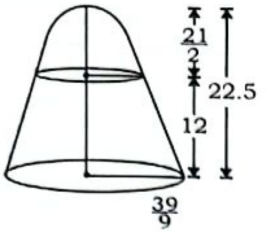
Slant height of cone
$(l) = \sqrt{105^2 + 36^2}$
$= \sqrt{11025 + 1296} = 111$
T.S.A = $\pi rl + 2\pi r^2 = \pi r[l + 2r]$
$= \pi \times 36\,(111 + 72) = 6588\pi \text{ cm}^2$
Note: Unit digit avoid the calculation last step.

Alternate Method:

Use triplet
$$\begin{matrix} 12 & : & 35 & : & 37 \\ \downarrow{\scriptstyle \times 3} & & \downarrow{\scriptstyle \times 3} & & \downarrow{\scriptstyle \times 3} \\ 36 & & 105 & & 111 \end{matrix}$$
$l = 111$
T.S.A of the toy = $\pi rl = 2\pi r(l + zr)$
$= \pi \times 36 \times (111 + 72)$
$= \pi \times 36 \times 183 = 6588\pi$

SMART APPROACH:-
Given, radius of cone = 36
Now option (b)
only divisible by 9

438. (d)



$l = \sqrt{h^2 + (R - r)^2}$

$= \sqrt{12^2 + \left(\frac{39}{2} - \frac{21}{2}\right)^2} = 15$

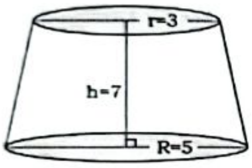
Required Area = $\pi(r + R)l + 2\pi r^2$

$= \frac{22}{7}\left(\frac{21}{2} + \frac{39}{2}\right)15 + 2 \times \frac{22}{7} \times \left(\frac{21}{2}\right)^2$

$= \frac{22}{7} \times \frac{60}{2} \times 15 + 2 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$

$= \frac{22}{7} \times \frac{1341}{2} = \frac{14751}{7} = 2107\ \frac{2}{7}\ m^2$

439. (b)



Volume of frustum

$= \frac{1}{3}\ \pi(R^2 + r^2 + Rr)h$

$= \frac{1}{3} \times \frac{22}{7}(25 + 9 + 15) \times 7$

$= \frac{22}{3} \times 49 = 359.3\ cm^3$

440. (b) D = 28, r = 14 (Given)
Total surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 14 \times 14 = 2464\ cm^2$

Note:-Answer must be a multiple of 11. Only option (b) satisfy.

441. (c) $r = \frac{d}{2} = \frac{42}{2} = 21cm$

Surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 21 \times 21 = 5544\ cm^2$

Note:-Answer must be a multiple of 11. Only option (c) satisfy.

442. (a) Surface area of ball = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 21 \times 21 = 5544\ mm^2$

Note:-Answer must be a multiple of 11. Only option (a) satisfy.

443. (c) Surface area of sphere = $4\pi r^2$

$\Rightarrow 616 = 4 \times \frac{22}{7} \times r^2$

$\Rightarrow r^2 = \frac{616 \times 7}{88} \Rightarrow r^2 = 49$

$\Rightarrow r = 7$

$\therefore$ Radius of sphere = 7 cm.

444. (a) Effective percentage increase

$= 40 + 40 + \frac{40 \times 40}{100} = 96\%$

445. (d) Effective increment in surface area

$= 125 + 125 + \frac{125 \times 125}{100}$

$= 250 + 156.25 = 406.25\%$

Alternate Method:

$125\% = \frac{5}{4}$

$4 : 9$

$\frac{4}{16} : \frac{9}{81}$

65

Required% $= \frac{65}{16} \times 100 = 406.25\%$

446. (a) Surface area of sphere = $4\pi r^2$
ATQ,
$4\pi\,[(r + 3.5)^2 - r^2] = 550$

$\Rightarrow 4 \times \frac{22}{7} \times [r^2 + 12.25 + 7r - r^2] = 550$

$\Rightarrow 12.25 + 7r = 43.75 \Rightarrow 7r = 31.5$

$\Rightarrow r = 4.5$ cm

Original radius of sphere = 4.5 cm

447. (a) Diameter = 28 cm

$\Rightarrow$ Radius $= \frac{28}{2} = 14$ cm

Surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 14 \times 14 = 88 \times 28 = 2464\ cm^2$

$\therefore$ Cost of painting
= Rs. 2 × 2464 = Rs. 4928

448. (c) Surface area of sphere = $4\pi r^2$
$= 4\pi \times 5^2 = 100\pi\ m^2$

$\therefore$ Cost of painting $= 100\pi \times \frac{80}{\pi}$
= Rs.8000

449. (a) Total surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 14 \times 14 = 88 \times 28 = 2464\ cm^2$

$\therefore$ cost of painting = 5 × 2464
= Rs.12320

450. (d) $r = \frac{d}{2} = \frac{14}{2} = 7$

Surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 7 \times 7 = 88 \times 7\ cm^2$

$\therefore$ Cost of painting per square cm

$= \frac{21560}{88 \times 7}$ = Rs.35

451. (c) Total cost of painting = $4\pi r^2 \times 13$

$= 4 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 13$

= 154 × 13 = ₹2002

Note:-Answer must be a multiple of 11. Only option (c) satisfy.

452. (c) Cost = $3 \times 4\pi r^2 + 2 \times 2\pi r^2$
$= 12\pi r^2 + 4\pi r^2 = 16\pi r^2$
= 16 × 3.14 × 4 × 4 = ₹803.84

Note:- Use unit digit method to avoid calculation

453. (c) Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1 = 38.808\ cm^3$

Note: Answer is divisible by 11
So, option (c) is correct

454. (b) Volume of sphere $= \frac{4}{3}\pi r^3$
ATQ,

$\Rightarrow \frac{4}{3}\pi r^3 = 38808\ cm^3$

$\Rightarrow r^3 = \frac{38808 \times 3 \times 7}{4 \times 22}$

$\Rightarrow r^3 = 441 \times 21 \Rightarrow r = 21$ cm

455. (c) Volume of sphere $= \frac{4}{3}\pi r^3$

$\Rightarrow \frac{4}{3}\pi r^3 = 972\pi$

$\Rightarrow r^3 = 729 \Rightarrow r = 9$

456. (a) Volume of sphere $= \frac{4}{3}\pi r^3$

$\Rightarrow 38.808 = \frac{4}{3} \times \frac{22}{7} \times r^3$

$\Rightarrow r^3 = 9.261 \Rightarrow r = 2.1$ cm

$\therefore$ Diameter = 2 × 2.1 = 4.2 cm

457. (c) Surface area of sphere = $4\pi r^2$

$\Rightarrow 2464 = 4 \times \frac{22}{7} \times r^2 \Rightarrow r = 14$ cm

$\therefore$ Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14$

$= \frac{34496}{3} = 11498\frac{2}{3}\ cm^3$

458. (a)

	Old	New
$r \rightarrow$	2 :	1
$v \propto r^3 \rightarrow$	8 :	1

Reduced by $\frac{1}{8}$ of former volume.

459. (c) Volume of sphere $= \frac{4}{3}\pi r^3$
Radius → 4 : 5
Volume → $4^3 : 5^3$
= 64 : 125

460. (d) Surface area of sphere = $4\pi r^2$

$\therefore \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{25}{36} \Rightarrow \frac{r_1}{r_2} = \frac{5}{6}$

Volume of sphere $= \frac{4}{3}\pi r^3$

$\therefore \frac{\frac{4\pi r_1^3}{3}}{\frac{4\pi r_2^3}{3}} = \frac{125}{216}$

Alternate Method:
Surface area of sphere = $4\pi r^2$

Volume of sphere $= \frac{4}{3}\pi r^3$

(2D) Area → 25 : 36
(1D) r → 5 : 6
$\therefore$(3D) Volume → 125 : 216

461. (b) Surface area of sphere = $4\pi r^2$

$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{49}{81} \Rightarrow \frac{r_1}{r_2} = \frac{7}{9}$

Volume of sphere $= \frac{4}{3}\pi r^3$

$\therefore \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{7^3}{9^3} = \frac{343}{729}$

Alternate Method:

Surface area of sphere = $4\pi r^2$

Volume of sphere = $\frac{4}{3}\pi r^3$

(2D) Area → 49 : 81
(1D) r → 7 : 9
∴(3D) Volume → 343 : 729

462. (c) Surface area of spherical ball = $4\pi r^2$

$\Rightarrow 1386 = 4 \times \frac{22}{7} \times r^2$

$\Rightarrow r^2 = 110.25 \Rightarrow r = 10.5$

Volume of spherical ball = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (10.5)^3 = 4851 \text{ cm}^3$

SMART APPROACH:-

Answer must be a multiple of 11.
only option (c) satisfy the condition.

463. (d) Area ∝ side²
volume ∝ side³
Area = 9 : 49
Side = 3 : 7
Volume = 27 : 343

464. (d) Surface area of sphere = $4\pi r^2$

$\Rightarrow 4\pi r^2 = 2464 \Rightarrow 4 \times \frac{22}{7} \times r^2 = 2464$

$\Rightarrow r^2 = 7 \times 7 \times 4 \Rightarrow r = 14$

Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (14)^3 = 11498.67 \text{ cm}^3$

465. (c)

	P	Q
r	4	1
$v \propto r^3$	64	1

Required ratio = 64 : 1

466. (c) $R_1 : R_2 = 7 : 14 = 1 : 2$
$V_1 : V_2 = (1 : 2)^3 = 1 : 8$

467. (a) $\sqrt[3]{\text{Volume}} \propto$ side
side² ∝ area

$\Rightarrow V = (512 : 3375)^{\frac{1}{3}}$
$\Rightarrow a = (8 : 15)^2$
$\Rightarrow a^2 = 64 : 225$

468. (b) Volume of sphere = $\frac{4}{3}\pi r^3$

$\Rightarrow \frac{4}{3}\pi r^3 = \frac{256}{3}\pi \Rightarrow r^3 = 64 \Rightarrow r = 4\text{cm}$

T.S.A of sphere = $4\pi r^2$
$= 4 \times \pi \times 4 \times 4 = 64\,\pi \text{ cm}^2$

469. (b) Given,
Volume of sphere = 130977

$\Rightarrow \frac{4}{3}\pi r^3 = 130977$

$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3 = 130977$

$\Rightarrow r^3 = \frac{130977 \times 7 \times 3}{4 \times 22}$

$\Rightarrow r^3 = \frac{11907 \times 21}{2 \times 4} \Rightarrow r = \frac{63}{2}$

Surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times \frac{63}{2} \times \frac{63}{2}$

$= 22 \times 9 \times 63 = 12474 \text{ cm}^2$

470. (b) Given,
Volume of sphere = 38808

$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3 = 38808$

$\Rightarrow r^3 = 441 \times 21 \Rightarrow r = 21$

∴ Surface area

$= 4\pi r^2 = 4 \times \frac{22}{7} \times 21 \times 21 = 5544 \text{ cm}^2$

Note:-Answer must be a multiple of 11. Only option (b) satisfy.

471. (b) Volume of sphere = $\frac{4}{3}\pi r^3$

$\Rightarrow \frac{4}{3} \times 3.14 \times r^3 = 24416.64$

$\Rightarrow r = 18$

Surface area = $4\pi r^2$
$= 4 \times 3.14 \times 18 \times 18 = 4069.44 \text{ cm}^2$

Note:- Without doing complete calculation, Check which option is multiple of '9'.
Only Option (b) Satisfied.

472. (c) ATQ,
Volume of sphere = 14 × Surface area of sphere

$\Rightarrow \frac{4}{3}\pi r^3 = 14 \times 4\pi r^2 \Rightarrow r = 42 \text{ cm}$

473. (c) $\because \frac{4\pi r^2}{\frac{4}{3}\pi r^3} = \frac{2}{7}$

$\Rightarrow r = \frac{21}{2} \Rightarrow r = 10.5 \text{ cm}$

474. (b) Volume ∝ (radius)³

$\frac{\text{Volume of A}}{\text{Volume of B}} = \left(\frac{r_A}{r_B}\right)^3 = \frac{125}{64}$

$\Rightarrow \frac{r_A}{r_B} = \frac{5}{4} \Rightarrow r_A + r_B = 9x$

$9x = 36 \Rightarrow x = 4$

$r_A = 20$ and $r_B = 16$

Surface area of sphere A

$= 4 \times \pi \times r_A^2$

$= 4 \times \pi \times 400 = 1600\pi \text{ cm}^2$

475. (d) Surface area $\Rightarrow 4\pi r^2 = 6a^2$

$\Rightarrow a = \sqrt{\frac{2\pi}{3}}.r$

Ratio of volume,

$$\frac{\frac{4}{3}\pi r^3}{a^3} = \frac{\frac{4}{3}\pi r^3}{\left(\sqrt{\frac{2\pi}{3}} \times r\right)^3} = \frac{\sqrt{6}}{\sqrt{\pi}}$$

476. (c) ATQ,

$\frac{4}{3}\pi R^3 - \frac{1}{3}\pi R^2 h = \frac{1}{3}\pi R^2 (4R - h)$

$= \frac{1}{3} \times \frac{22}{7} \times 49[28 - 10]$

$= \frac{1}{3} \times 22 \times 7 \times 18$

$= 22 \times 42 = 924 \text{ cm}^3$

477. (c) Volume of sphere ball of diameter 18 cm = N × Volume of sphere ball of diameter 2 cm

$\Rightarrow \frac{4}{3}\pi r_1^3 = N \times \frac{4}{3}\pi r_2^3 \Rightarrow (9)^3 = N \times (1)^3$

$\Rightarrow N = 729$

∴ No. of paper balls made = 729.

478. (a) Given, R + r = 14cm .....(i)

$4\pi R^2 - 4\pi r^2 = 112\pi$

$\Rightarrow (R + r)(R - r) = 28$

$\Rightarrow 14 \times (R - r) = 28$

$\Rightarrow R - r = 2\text{cm}$ .....(ii)

From equation (i) and (ii)
R = 8cm
r = 6cm
R : r = 4 : 3

$\therefore \frac{V_a}{V_b} = \left(\frac{4}{3}\right)^3 = 64 : 27$

479. (d) No. of laddoo = $\frac{\text{Volume of bigger laddo}}{\text{Volume of smaller laddo}}$

$= \frac{\frac{4}{3}\pi R^3}{\frac{4}{3}\pi r^3} = \frac{5 \times 5 \times 5}{2.5 \times 2.5 \times 2.5} = 8$

480. (a) ATQ,

$\frac{4}{3}\pi R^3 = n \times \frac{4}{3}\pi r^3$

$\Rightarrow R^3 = n \times r^3$

$\Rightarrow 9 \times 9 \times 9 = n \times 3 \times 3 \times 3$

$\Rightarrow n = 27$

481. (c) C.S.A of Hemisphere = $2\pi r^2$

$= 2 \times \frac{22}{7} \times 21 \times 21 = 2772 \text{ cm}^2$

$\therefore$ 75% of CSA = $\frac{2772 \times 75}{100} = 2079$

~ 2080 cm² (Approx)

482. (a) Volume of hollow sphere

$= \frac{4}{3}\pi(R^3 - r^3) = \frac{4}{3}\pi(4^3 - 1^3) = 84\pi \text{ cm}^3$

483. (a) Volume of spherical shell

$= \frac{4}{3}\pi(R^3 - r^3) = \frac{4}{3} \times \pi(3^3 - 2^3)$

$= 19 \times \frac{4}{3}\pi = \frac{76}{3}\pi$

484. (b) Diameter = 21 cm, then radius

$= \frac{21}{2}$ cm

Curved surface area of hemisphere = $2\pi r^2$

$= 2 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = 693$

Note:- No need to calculate, just find the multiple of 11.

485. (a) CSA of hemisphere = $2\pi r^2$

$= 2 \times \frac{22}{7} \times 5.6 \times 5.6$

$= 1.6 \times 22 \times 5.6$

Total cost of painting
$= 25 \times 22 \times 5.6 \times 1.6 =$ ₹4928

Note: With the help of unit digit, only option (a) satisfy.

Alternate Method:

Check the multiple of 11 in options

486. (a) Circumference of dome = 154

$\Rightarrow 2\pi r = 154 \Rightarrow r = \frac{49}{2}$ cm

Curved surface area of dome = $2\pi r^2$

$= 2 \times \frac{22}{7} \times \frac{49}{2} \times \frac{49}{2} = 11 \times 7 \times 49 \text{ cm}^2$

Cost of painting 100 cm² = ₹4
Cost of painting 11 × 7 × 49 cm²

$= \frac{4}{100} \times 11 \times 7 \times 49 =$ ₹150.92

487. (a) C.S.A of bowl = $2\pi r^2$

$= 2 \times \frac{22}{7} \times 42 \times 42 = 11088\ cm^2$

Total Cost = 110.88 × 21

= ₹2328.48

Note:- Without doing complete calculation, Check which option is multiple of 7.

Only Option (a) Satisfied.

488. (d) Total surface area of hemisphere

$= 3\pi r^2$

$= 3 \times 3.14 \times 6.2 \times 6.2 = 362.10\ cm^2$

489. (d) T.S.A. of hemisphere = $3\pi r^2$

$= 3\pi(11)^2 = 3\pi \times 121 = 363\pi\ cm^2$

490. (d) Total surface area of hemi-sphere

$= 3\pi r^2$

$= 3 \times \frac{22}{7} \times 14 \times 14$

$= 66 \times 28 = 1848\ cm^2$

491. (a) Total surface area of hemisphere

$= 3\pi r^2$

$= 3\pi \times \left(\sqrt{\frac{25}{\pi}}\right)^2 = 3\pi \times \frac{25}{\pi} = 75\ unit^2$

492. (b) Surface area of sphere = $4\pi r^2$

$\Rightarrow 616 = 4\pi r^2$

$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 616$

$\Rightarrow r^2 = \frac{616}{88} \times 7 \Rightarrow r^2 = 7 \times 7 \Rightarrow r = 7$

Total surface area of hemisphere

$= 3\pi r^2 = 3 \times \frac{22}{7} \times 7 \times 7 = 66 \times 7$

$= 462\ cm^2$

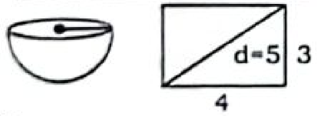
SMART APPROACH:-

$4\pi r^2 = 616$

$3\pi r^2 = \frac{616}{4} \times 3$

$= 462\ cm^2$

493. (d)



ATQ,

Diameter of hemisphere = diagonal of rectangle

$\Rightarrow r = \frac{5}{2}$

T.S.A of hemisphere = $3\pi r^2$

$= 3 \times \pi \times \frac{5}{2} \times \frac{5}{2} = \frac{75\pi}{4}$

494. (c) Painting is being done inside as well as outside.

$\therefore 2\pi r^2$ (inside) + $2\pi r^2$ (outside) = $4\pi r^2$

$\therefore$ Cost $= 4 \times \frac{22}{7} \times 21 \times 21 \times 0.05$

= ₹277.20

495. (c)

	Old	:	New
$r \rightarrow$	4	:	7
S.A $\propto r^2 \rightarrow$	16	:	49

Required ratio = 49 : 16

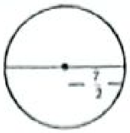
496. (d) C.S.A of Hemisphere ($2\pi r^2$) = 22

$\Rightarrow \pi r^2 = 11$

T.S.A of Hemisphere ($3\pi r^2$)

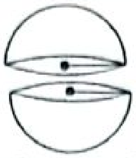
$= 11 \times 3 = 33\ cm^2$

497. (a)



$\because r = \frac{7}{2}$ cm

Total surface Area = $4\pi r^2$



Total surface area of two hemisphere

$= 3\pi r^2 + 3\pi r^2 = 6\pi r^2$

Increased total surface area $= 6\pi r^2 - 4\pi r^2$

$= 2\pi r^2 = 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 77\ cm^2$

SMART APPROACH:-

When a sphere is cut into two equal halves, then increase in surface area = $2\pi r^2$

$= 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 77 cm^2$

498. (c) T.S.A of hemisphere – C.S.A of hemisphere $= 3\pi r^2 - 2\pi r^2 = \pi r^2$

$= \pi \times 2 \times 2 = 4\pi\ cm^2$

499. (a) r = 9 cm (Given)

Volume of hemispherical bowl = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times 9 \times 9 \times 9 = 1527.43\ cm^3$

500. (d) Volume of a hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times (18)^3 = 12219.43$

501. (d) Volume of hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1$

$= 19.404 m^3 = 19404$ liters

Note:-Answer must be a multiple of 11. Only option (d) satisfy.

502. (c) Volume of hemisphere = $\frac{2}{3}\ \pi r^3$

$= \frac{2}{3} \times 3.14 \times 5.5 \times 5.5 \times 5.5$

$= 348.27\ cm^3 \sim 348\ cm^3$

503. (a) $r = \frac{42}{2} = 21$ cm

Volume of hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times 21 \times 21 \times 21 = 19404.$

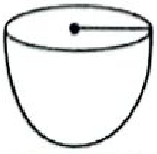
Note:- Use digital sum method to avoid calculation.

$\frac{2}{3} \times \frac{22}{7} \times 21 \times 21 \times 21 = 44 \times 441$

DS = 8 × 9 = 9

DS of 19404 = 9

504. (a)



$r = \frac{21}{2}$ cm

Volume of Hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2} = \frac{441 \times 11}{2}$

$= \frac{4851}{2} = 2425.5\ cm^3$

505. (b) Given,

T.S.A of hemisphere = $3\pi r^2$

$\Rightarrow 4158 = 3\pi r^2$

$\Rightarrow r^2 = \frac{4158}{3 \times 22} \times 7 = 63 \times 7$

$\Rightarrow r = 21$

Volume of hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times 21 \times 21 \times 21 = 19404\ cm^3$

[Solve by unit digit go through option]

506. (d) Volume of hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times 21 \times 21 \times 21 = 19404\ cm^3$

Hints:- Do it with the help of unit digit. Hence, only option (d) is correct.

507. (d) Surface area of sphere = $4\pi r_1^2$

Surface area of hemi sphere = $3\pi r_2^2$

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{3}{4} \Rightarrow \frac{r_1}{r_2} = \frac{\sqrt{3}}{2}$

$\therefore \frac{\frac{4}{3}\pi r_1^3}{\frac{2}{3}\pi r_2^3} = 2 \times \frac{(\sqrt{3})^3}{(2)^3} = \frac{3\sqrt{3}}{4} = 3\sqrt{3} : 4$

508. (c) Perimeter of bowl = $2\pi R$

ATQ,

$\Rightarrow 2\pi R = 88$

$\Rightarrow 2 \times \frac{22}{7} \times R = 88$

$\Rightarrow R = 14$

$r = \frac{7}{2}$ (Given)

No. of glasses

$= \frac{\text{Volume of hemispherical bowl}}{\text{Volume of glass}}$

$= \frac{\frac{2}{3}\pi R^3}{\frac{2}{3}\pi r^3} = \frac{14 \times 14 \times 14}{\frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}} = 64$

509. (c) Radius of a sphere = R

Radius of a hemisphere = r

R : r = 3 : 1

Ratio of volume $= \frac{4}{3}\pi R^3 : \frac{2}{3}\pi r^3$

$= \frac{4}{3}\pi(3)^3 : \frac{2}{3}\pi(1)^3 = 54 : 1$

510. (a) Inner radius = 12

Outer radius = 12.5

Total surface area of hollow hemisphere = outer surface area + inner surface area + area of ring

$= 2\pi R^2 + 2\pi r^2 + \pi(R^2 - r^2)$

$= \pi[(2 \times (12.5)^2 + 2 \times (12)^2 + (12.5)^2 - (12)^2)]$

$= \pi(312.5 + 288 + 12.25) = 612.75\pi$

511. (d) Total surface area of hemispherical bowl to be painted = Area of outer surface + Area of inner surface + Area of top

$= 2\pi R^2 + 2\pi r^2 + \pi(R^2 - r^2)$

$= 2\pi 8^2 + 2\pi 6^2 + \pi(8^2 - 6^2)$

$= 128\pi + 72\pi + 28\pi = 228\pi$

∴ Cost of polishing = 228 × 50 = ₹11400

512. (a) Total surface area of hollow hemisphere = Area of inner sphere + area of outer sphere + area of ring

$= 2\pi(6)^2 + 2\pi(7)^2 + \pi[(7)^2 - (6)^2]$

$= \pi[72 + 98 + 13] = 183\pi$

513. (a) r_1 = outer radius = 4 + 1 = 5 cm

r_2 = inner radius = 4 cm

Volume of steel $= \frac{2}{3}\pi\left(r_1^3 - r_2^3\right)$

$= \frac{2}{3}\pi\left(5^3 - 4^3\right) = \frac{2}{3}\pi(125 - 64)$

$= \frac{2}{3}\pi \times 61 = \frac{122}{3}\pi = 40\frac{2}{3}\pi \text{ cm}^3$

514. (d) Inner radius (r) = 5cm

Outer radius (R) = 5 + 0.25 = 5.25 cm

Volume of required material in making the bowl $= \frac{2}{3}\pi\left(R^3 - r^3\right)$

$= \frac{2}{3} \times \frac{22}{7} \times [(5.25)^3 - (5)^3] = 41.28 \text{ cm}^3$

515. (a) Inner radius (r) = 2 cm, Outer radius (R) = 2 + 0.5 = 2.5 cm

Volume of silver used $= \frac{2}{3}\pi(R^3 - r^3)$

$= \frac{2}{3} \times 3.14 \times (2.5^3 - 2^3)$

$= \frac{2}{3} \times 3.14 \times 7.625 = 15.96 \text{ cm}^3$

516. (a) Volume of cuboid = 2 × volume of cube

$\Rightarrow l \times b \times h = 2 \times a^3$

$\Rightarrow 32 \times 12 \times 9 = 2 \times a^3$

$\Rightarrow 16 \times 12 \times 9 = a^3 \Rightarrow a = 12$

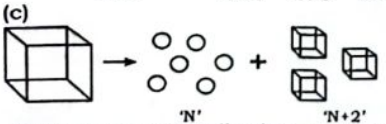
$\therefore \frac{\text{Total surface area of cuboid}}{\text{Total surface area of 2 cubes}}$

$= \frac{2(lb + bh + hl)}{2 \times 6a^2}$

$= \frac{32\times12 + 12\times9 + 9\times32}{6\times12\times12}$

$= \frac{384 + 108 + 288}{864} = \frac{780}{864} = \frac{195}{216} = \frac{65}{72}$

517. (c)



Given, radius of small spheres = 3 cm

Volume of cuboid = (4 × 4 × 6·5) cm³

Side of cube = 12 cm

ATQ,

12 × 12 × 12

$= \left(\frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 \times N\right) + (N + 2)$

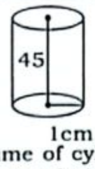
(4 × 4 × 6·5)

$\Rightarrow 1728 = \frac{88}{7} \times 9N + 104N + 208$

$\Rightarrow 1520 = \frac{792}{7} \times N + 104N$

$\Rightarrow 1520 = \frac{1520}{7} N \Rightarrow N = 7$

518. (d)



ATQ, Volume of cylindrical metallic rod = Volume of wire

$\Rightarrow \pi R^2 H = \pi r^2 h$

$\Rightarrow \pi \times 1 \times 1 \times 45 = \pi \times r^2 \times 5 \times 100$

$\Rightarrow r^2 = \frac{9}{100} \Rightarrow r = 0.3 \text{ cm}$

∴ Diameter = 0.6 cm = 6 mm

519. (c) $\frac{d_1}{d_2} = \frac{1}{4} \Rightarrow \frac{r_1}{r_2} = \frac{1}{4}$

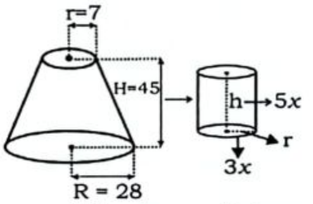
Volume of sphere $= \frac{4}{3}\pi r^3$

ATQ,

$$\frac{\frac{4}{3}\pi(4)^3}{\frac{4}{3}\pi(1)^3} = \frac{125\times1}{27\times m}$$

$\Rightarrow 64 = \frac{125\times1}{27\times m} \Rightarrow m = \frac{125}{1728}$

520. (b)



Volume of frustum = Volume of cylinder

$\Rightarrow \frac{1}{3}\pi H\left(R^2 + Rr + r^2\right) = \pi r^2 h$

$\Rightarrow \frac{45}{3}\left[28^2 + (28\times7) + 7^2\right] = 9x^2 \times 5x$

$\Rightarrow 784 + 196 + 49 = 3x^3$

$\Rightarrow 1029 = 3x^3 \Rightarrow x^3 = 343 \Rightarrow x = 7$

∴ Radius of cylinder = 3 × 7 = 21 cm

Height of cylinder = 5 × 7 = 35 cm

∴ C.S.A of cylinder = 2πrh

$= 2 \times \frac{22}{7} \times 21 \times 35 = 4620 \text{ cm}^2$

521. (b) Given,

Height of frustum (h) = 18 cm

(R) = 25 cm, (r) = 20 cm

Diameter of sphere (d) = 2cm

Radius of sphere (r_{sphere}) = 1 cm

Let the numbers of sphere be formed = n.

∴ Volume of frustum = n × volume of spheres

$\Rightarrow \frac{1}{3}\pi h\left(R^2 + r^2 + R.r\right) = n \times \frac{4}{3}\pi r^3$

$\Rightarrow 18\,(25^2 + 20^2 + 25\times20) = n \times 4 \times (1)^3$

$\Rightarrow 18\,(625 + 400 + 500) = 4n$

$\Rightarrow n = 6862.5$

∴ Required numbers of sphere = 6862

522. (d) Volume of sphere $= \frac{4}{3}\pi r^3$

ATQ, $\frac{4}{3}\pi\,(3^3 + 4^3 + 5^3) = \frac{4}{3}\pi R^3$

$\Rightarrow 27 + 64 + 125 = R^3$

$\Rightarrow R^3 = 216 \Rightarrow R = 6 \text{ cm}$

523. (a) ATQ,

Volume of sphere = Volume of cylinder

$\Rightarrow \frac{4}{3}\pi R^3 = \pi r^2 h$ $\boxed{1\text{mm} = \frac{1}{10}\text{cm}}$

$\Rightarrow \frac{4}{3} \times 9 \times 9 \times 9 = 0.4 \times 0.4 \times h$

$\Rightarrow h = 6075 \text{ cm} = 60.75 \text{ m}$

524. (a) Volume of sphere $= \frac{4}{3}\pi r^3$

ATQ,

$\frac{4}{3}\pi(75^3 + 60^3 + 45^3) = \frac{4}{3}\pi \times R^3$

$\Rightarrow \frac{4}{3}\pi \times 15^3 \times (5^3 + 4^3 + 3^3) = \frac{4}{3}\pi \times R^3$

$\Rightarrow \frac{4}{3}\pi \times 15^3 \times 6^3 = \frac{4}{3}\pi \times R^3$

∴ R = 15 × 6 = 90 cm

525. (a) Total surface area of cube = $6a^2$

$\Rightarrow 6a^2 = 54 \Rightarrow a = 3$

ATQ,

$6a_1^2 = \frac{8}{12} \Rightarrow a_1 = \frac{1}{3}$

Side of smaller cube $(a_1) = \frac{1}{3}$

Volume of cube = a^3

∴ Total number of smaller cube

$= \frac{3\times3\times3}{\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}} = 729$

526. (b) Let, number of cones made = n

Volume of cone $= \frac{1}{3}\pi r^2 h$

ATQ,

Volume of sphere = Volume of cone × n

$\Rightarrow 3136\pi = \frac{1}{3}\pi \times 3.5 \times 3.5 \times 4 \times n$

$\Rightarrow n = \frac{3136\times3}{3.5\times3.5\times4} = 192$

∴ Number of cone = 192

527. (c) Let no of spherical balls = n

ATQ,

Volume of Cylinder = Volume of sphere × n

$\Rightarrow \pi R^2 h = \frac{4}{3}\pi r^3 \times n$

$\Rightarrow R^2 \times 12R = \frac{4}{3} \times \left(\frac{1}{3}R\right)^3 \times n$

$\Rightarrow 12R^3 = \frac{4}{3} \times \frac{1}{27} R^3 \times n$

$\Rightarrow n = 9 \times 27 = 243$

Hence, no. of spherical balls = 243

528. (b) Volume of cube = a^3

ATQ,

$6^3 + 8^3 + 10^3 = a^3$

$\Rightarrow 216 + 512 + 1000 = a^3$

$\Rightarrow 1728 = a^3 \Rightarrow a = 12$

Total surface area of cube = $6a^2$

$= 6 \times 12 \times 12 = 864 \text{ cm}^2$

Note:- It can be done with the help of unit digit.

529. (b) Volume of cylinder = $\pi r^2 h$

ATQ,

$\pi \times 6 \times 6 \times 10 = n \times \pi \times 2 \times 2 \times 2.5$

$\Rightarrow n = 3 \times 3 \times 4 = 36$

∴ Number of smaller cylinders = 36

530. (c) Volume of cylinder = n × volume of cuboid
$\Rightarrow \pi r^2 h = n \times l \times b \times h$
$\Rightarrow \frac{22}{7} \times 7 \times 7 \times 2 = n \times 7 \times 11 \times 2$
$\Rightarrow n = 2$
∴ No. of cuboidal candles = 2

531. (a) ATQ,
Volume of melted sphere = n × volume of recasted sphere.
$\Rightarrow \frac{4}{3}\pi r_1^3 = n \times \frac{4}{3}\pi r_2^3$
$\Rightarrow (6)^3 = n \times (3)^3$
$\Rightarrow n = \frac{6 \times 6 \times 6}{3 \times 3 \times 3} = 8$
∴ The number of recasted sphere = 8

532. (b) ATQ,
Volume of spherical melted ball
= N × No. of spherical ball made
$\Rightarrow \frac{4}{3}\pi r_1^3 = N \times \frac{4}{3}\pi r_2^3$
$\Rightarrow r_1^3 = r_2^3 \times N \Rightarrow 8^3 = 2^3 \times N \Rightarrow N = 64$
∴ No. of spherical balls made = 64

533. (d) No. of cubes
$= \frac{\text{Volume of cuboid}}{\text{Volume of cube}} = \frac{l \times b \times h}{a^3}$
$= \frac{36 \times 22 \times 12}{6 \times 6 \times 6} = 44.$

534. (a) We know that,
Diameter of sphere = 12 cm
Diameter of wire = 4 mm = 0.4 cm
So, radius of sphere (R) = 6 cm
Radius of wire (r) = 0.2 cm
Equate volume
Volume of sphere = Volume of wire
$\Rightarrow \frac{4}{3}\pi R^3 = \pi r^2 h$
$\Rightarrow \frac{4}{3}\pi \times 6 \times 6 \times 6 = \pi \times 0.2 \times 0.2 \times h$
$\Rightarrow h = 7200$ cm

535. (d) Given,
$R_1 = \frac{10}{2} = 5, R_2 = \frac{6}{2} = 3$
ATQ,
$\Rightarrow \frac{4}{3}\pi (R_1^3 - R_2^3) = \frac{1}{3}\pi r^2 h$
$\Rightarrow 4(5^3 - 3^3) = 5^2 \times h$
$\Rightarrow 4 \times 98 = 25 \times h$
$\therefore h = 15.68$ cm

536. (d) $V = v_1 + v_2$
$v_1 = x, v_2 = 2x$
$\therefore V = x + 2x = 3x$
ATQ,
$\pi R^2 \times 12 : \frac{1}{3}\pi r_1^2 \times 12 : \frac{1}{3} \times \pi \times r_2^2 \times 12 = 3 : 1 : 2$
$\Rightarrow R^2 : \frac{r_1^2}{3} : \frac{r_2^2}{3} = 3 : 1 : 2$
$\Rightarrow R^2 : r_1^2 : r_2^2 = 3 : 3 : 6$
$= 1 : 1 : 2 = y : y : 2y$
Ratio of flat square area of cylinder and cone
$= 2\pi R^2 : \pi(r_1^2 + r_2^2)$
$= 2 \times y : y + 2y = 2 : 3$
Required% $= \frac{(3-2)}{2} \times 100 = 50\%$

537. (c) Volume of (Ball) = Volume of dice + volume of ball
$\Rightarrow \frac{4}{3}\pi r^3 = 27 \times a^3 + \frac{4}{3}\pi r^3$
$\Rightarrow \frac{4}{3}\pi 3^3 = 27 \times a^3 + \frac{4}{3} \times \pi \times (1)^3$
$\Rightarrow \frac{4}{3}\pi(27 - 1) = 27a^3$
$\Rightarrow \frac{4}{3}\pi \times 26 = 27a^3$
$\Rightarrow a^3 = \frac{88 \times 26}{21 \times 27}$
$\Rightarrow a = 1.6$

538. (b) Let x small cubes be obtained.
ATQ,
$48 \times 48 \times 48 = 4 \times 4 \times 4 \times x$
$\Rightarrow x = 1728$

539. (b) Given,
$r_1 = 12, \quad r_2 = 4$ cm
Let 'n' number of solid hemisphere to be made
ATQ,
Volume of sphere = n × Volume of hemisphere
$\Rightarrow \frac{4}{3} \times \pi \times r_1^3 = \frac{2}{3}\pi r_2^3 \times n$
$\Rightarrow 2 \times 12 \times 12 \times 12 = 4 \times 4 \times 4 \times n$
$\Rightarrow 54 = n$
∴ Number of solid hemisphere = 54

540. (b) Given, $r_1 = 3$ cm , then $r_2 = \frac{3}{2}$ cm
ATQ,
Volume of spherical ball = x × Volume of hemisphere
$\Rightarrow \frac{4}{3}\pi \times 3^3 = x \times \frac{2}{3} \times \pi\left(\frac{3}{2}\right)^3$
$\Rightarrow \frac{2 \times 27 \times 8}{27} = x \Rightarrow x = 16$

541. (b) ∵ Diameter of sphere = 6 cm.
∴ Radius of sphere = 3 cm.
Diameter of wire = 0.4 cm.
radius of wire = 0.2 cm.
Let length of wire = h cm.
ATQ,
$\frac{4}{3}\pi \times (3)^3 = \pi \times (0.2)^2 \times h$
$\Rightarrow h = 900$ cm $\Rightarrow h = 9$ meter

542. (c) Let the side of cube = a
ATQ,
$a^3 = 2 \times 4 \times 1$
$\Rightarrow a^3 = 8 \Rightarrow a = 2$ units
∴ Total surface area of cube
$= 6a^2 = 6 \times 2^2 = 24$ units

543. (a) ATQ,
Volume of cube (a^3)
$= (2 \times 3 \times 4) + (2 \times 5 \times 4)$
$\Rightarrow a^3 = 64 \Rightarrow a = 4$ units

544. (c) Volume of cone = volume of cuboid
$\Rightarrow \frac{1}{3}\pi r^2 \times 14 = 11 \times 8 \times 6$
$\Rightarrow r^2 = 36 \Rightarrow r = 6$ cm

545. (d) ATQ,
$(15)^3 + (18)^3 + (25)^3 = a^3$
$\Rightarrow a^3 = 3375 + 5832 + 15625 = 24832$
$\Rightarrow a = 4\sqrt[3]{388}$ cm

546. (c) We know,
Volume of rectangular block
= Volume of sphere
$\Rightarrow l\,bh = \frac{4}{3}\pi r^3$
$\Rightarrow 88 \times 21 \times 21 = \frac{4}{3} \times \frac{22}{7} \times r^3$
$\Rightarrow 21^3 = r^3 \Rightarrow r = 21$ cm

547. (c) Let, required number be 'n'
ATQ,
Volume of cone = n × Volume of sphere
$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times 12 \times 12 \times 24$
$= n \times \frac{4}{3} \times \frac{22}{7} \times 2^3 \Rightarrow n = 108$

548. (c) Number of cubes
$= \frac{20 \times 16 \times 8}{4 \times 4 \times 4} = 5 \times 4 \times 2 = 40$

549. (d) Number of cones
$= \frac{\frac{4}{3}\pi \times (21)^3}{\frac{\pi}{3} \times (7)^2 \times 3} = \frac{4 \times 21 \times 21 \times 21}{7 \times 7 \times 3}$
$= 12 \times 21 = 252$

550. (a) Volume of cone = volume of sphere.
$\Rightarrow \frac{\pi}{3}r^2 h = \frac{4}{3}\pi \times (4)^3 \Rightarrow r^2 \times 4 = 4 \times (4)^3$
$\Rightarrow r^2 = 64 \quad \Rightarrow r = 8$ cm

551. (d) ATQ,
$d^3 = d_1^3 + d_2^3 + d_3^3$
$\Rightarrow 3^3 = \left(\frac{3}{2}\right)^3 + 2^3 + d_3^3$
$\Rightarrow d_3^3 = 27 - 8 - \frac{27}{8} = \frac{125}{8}$
$\Rightarrow d_3 = \frac{5}{2} = 2.5$ cm

552. (b) Given,
Diagonal $\left(a\sqrt{3}\right) = 18\sqrt{3}$
$\Rightarrow a = 18$ cm
$\because (3x)^3 + (4x)^3 + (5x)^3 = (18)^3$
$\Rightarrow 27x^3 + 64x^3 + 125x^3 = 5832$
$\Rightarrow 216x^3 = 5832$
$\Rightarrow x^3 = 27 \Rightarrow x = 3$
∴ Side of three cubes
$\Rightarrow 3x = 3 \times 3 = 9$ cm
$4x = 4 \times 3 = 12$ cm
$5x = 5 \times 3 = 15$ cm

553. (c) ATQ,
Volume of hollow Hemispherical bowl = Volume of cylinder
$\Rightarrow \frac{2}{3}\pi[R^3 - r^3] = \pi \times r^2 \times h$
$\Rightarrow \frac{2}{3}[5^3 - 3^3] = 7^2 \times h$
$\Rightarrow \frac{2}{3} \times 98 = 49 \times h$
$\Rightarrow h = \frac{4}{3} = 1.33$ cm

554. (b) A.T.Q,
Volume of hemisphere = 4 × Volume of spheres.
$\Rightarrow \frac{2}{3}\pi R^3 = 4 \times \frac{4}{3}\pi r^3$
$\Rightarrow 7 \times 7 \times 7 = 4 \times 2 \times r^3$
$\Rightarrow r = \frac{7}{2} = 3.5$ cm

555. (d) ATQ,
Volume of cone = volume of sphere

$\Rightarrow \frac{1}{3}\pi r^2 h = \frac{4}{3}\pi R^3$
$\Rightarrow r^2 \times 84 = 4 \times 21 \times 21 \times 21$
$\Rightarrow r = 21\text{cm}$

556. (a) R = 12 cm, r = 6 cm
ATQ,
x × volume of sphere = volume of hemi sphere

$\Rightarrow x \times \frac{4}{3} \times \pi \times (6)^3 = \frac{2}{3} \times \pi \times (12)^3$
$\Rightarrow x = 4$

557. (a) ATQ,
24 × volume of hemi sphere = volume of cylinder

$\Rightarrow 24 \times \frac{2}{3}\pi r^3 = \pi \times 12 \times 12 \times 24$
$\Rightarrow r^3 = 216 \Rightarrow r = 6\text{ cm}$

558. (c) Volume of three metallic cubes = volume of new cube
$\Rightarrow 6^3 + 8^3 + 10^3 = (a)^3$
$\Rightarrow 216 + 512 + 1000 = a^3$
$\Rightarrow 1728 = a^3 \Rightarrow (12)^3 = a^3$
$\Rightarrow a = 12\text{ cm}$

559. (b) Volume of cuboid = n × volume of sphere

$\Rightarrow l \times b \times h = n \times \frac{4}{3}\pi r^3$
$\Rightarrow 88 \times 63 \times 42$
$= n \times \frac{4}{3} \times \frac{22}{7} \times \left(\frac{8.4}{2}\right)^3$

$\Rightarrow n = \frac{88 \times 63 \times 42 \times 3 \times 7 \times 1000}{4 \times 22 \times 42 \times 42 \times 42}$
$\Rightarrow n = 750$

560. (b) ATQ,
Volume of sphere = Volume of Wire (Cylinder)

$\Rightarrow \frac{4}{3}\pi r^3 = \pi r^2 \times \text{Length}$
$\Rightarrow \frac{4}{3} \times (9)^3 = (0.3)^2 \times \text{Length}$

$\Rightarrow \text{Length} = \frac{4}{3} \times 9 \times 9 \times 100 = 10800$ cm = 108 m

561. (a) ATQ,
Volume of Cube = Volume of cuboid
$\Rightarrow (\text{Side})^3 = 18 \times 36 \times 9$
$\Rightarrow \text{Side} = 9 \times 2 = 18\text{ m}$

$\therefore \text{Diagonal} = \sqrt{3} \times \text{Side} = 18\sqrt{3}\text{ m}$

562. (b) $\frac{\text{C.S.A}}{\text{T.S.A}} = \frac{2\pi r_1 h}{2\pi r_1 (h + r_1)} = \frac{h}{h + r_1} = \frac{2}{5}$
$\Rightarrow h = 2x \;\&\; r_1 = 3x$ .....(i)
$r = 21$
Volume of Hemisphere = Volume of cylinder

$\Rightarrow \frac{2}{3}\pi r^3 = \pi r_1^2 h$

$\Rightarrow \frac{2}{3} \times (21)^3 = r_1^2 h$

From (i),

$\frac{2}{3} \times 21 \times 21 \times 21 = 9x^2 \times 2x$
$\Rightarrow x^3 = 7 \times 7 \times 7$
$\Rightarrow x = 7$
$\therefore r_1 = 3 \times 7 = 21\text{ cm}$

563. (d) ATQ,
Volume of rod = Volume of Wire

$\Rightarrow \pi \times 4 \times 12 = \pi \times r^2 \times \frac{12}{100}$
$\Rightarrow r = 20\text{ cm}$
∴ Thickness = 40 cm = 0.4 m.

564. (c) ATQ,
Volume of cube = Volume of cuboid
$\Rightarrow (\text{Side})^3 = 12 \times 18 \times 27$

$\Rightarrow \text{Side} = \sqrt[3]{12 \times 18 \times 27} = 18$

$\therefore \frac{\text{T.S.A. of cuboid}}{\text{T.S.A. of cube}} = \frac{2(lb + bh + lh)}{6a^2}$

$= \frac{2(12 \times 18 + 18 \times 27 + 27 \times 12)}{6 \times 18 \times 18} = \frac{2052}{1944}$

$= \frac{19}{18} = 19 : 18$

565. (a) ATQ,
Volume of cylinder = n × Volume of sphere

$\Rightarrow \pi r_1^2 h = n \times \frac{4}{3}\pi r_2^3$

$\Rightarrow \pi \times 2 \times 2 \times 90 = n \times \frac{4}{3} \times \pi \times (3)^3$

$\Rightarrow n = \frac{4 \times 90 \times 3}{4 \times 9 \times 3} = 10$

566. (a) Given,
$R_{\text{sphere}} = R_{\text{cone}}$
and, $3\pi R^2 = 462\text{ cm}^2$

$\Rightarrow R^2 = \frac{462}{3\pi} = 49 \Rightarrow R = 7\text{ cm}$

Now,

$\frac{1}{3}\pi R^2 h = \frac{2}{3}\pi R^3$
$\Rightarrow h = 2R = 2 \times 7 = 14\text{ cm}$

567. (d) ATQ,
8 × Volume of small sphere = Volume of large sphere

$\Rightarrow 8 \times \frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3 \Rightarrow 8 \times r^3 = R^3$

$\Rightarrow r^3 = \frac{14 \times 14 \times 14}{8} \Rightarrow r = 7$

$\therefore$ T.S.A of 8 small sphere $= 8 \times 4\pi r^2$

$= 4 \times 8 \times \frac{22}{7} \times 7 \times 7 = 4928\text{ cm}^2$

568. (c) Volume of large Sphere
= n × Volume of small sphere

$\Rightarrow \frac{4}{3}\pi R^3 = n \times \frac{4}{3}\pi r^3$

$\Rightarrow (42)^3 = n(7)^3 \Rightarrow n = 216$

569. (d) ATQ,
$l \times b \times h = n \times a^3$
$\Rightarrow 36 \times 18 \times 12 = n \times 6^3 \Rightarrow n = 36$

570. (c) Volume of old sphere without wastage:

$\frac{4}{3}\pi R^3 = 15 \times \frac{4}{3} \times \frac{22}{7} \times 5 \times 5 \times 5$

But 35% of this material is wasted.
So only 65% is left.

∴ Now, volume of sphere:

$\frac{4}{3}\pi R^3 = \frac{65}{100} \times 15 \times \frac{4}{3} \times \frac{22}{7} \times 5 \times 5 \times 5$
$\Rightarrow R^3 = 5^3 \times 9.75$

$\Rightarrow R = 5 \times \sqrt[3]{9.75} = 5 \times 2{\cdot}14 = 10{\cdot}68$

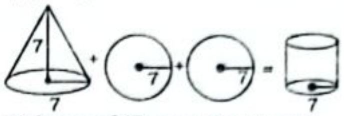
571. (b) Let, the number of sphere required = n
ATQ,

$n \times \frac{4}{3}\pi(5)^3 = \frac{1}{3}\pi(210)^2 \times 300$
$\Rightarrow n \times 4 \times 125 = 44100 \times 300$

$\Rightarrow n = \frac{(44100 \times 300)}{(4 \times 125)} \Rightarrow n = 26460$

Note:- Without doing complete calculation, Check which option is multiple of '9'.
Only Option (b) Satisfied.

572. (d) ATQ,



Volume of (Cone + 2 spheres)
= Volume of cylinder

$\Rightarrow \frac{1}{3} \times \pi \times 7^2 \times 7 + 2 \times \frac{4}{3}\pi \times 7^3 = \pi R^2 h$

$\Rightarrow \frac{1}{3}\pi \times 343 \times (1 + 8) = \pi R^2 h$
$\Rightarrow R^2 h = 343 \times 3$
$\Rightarrow 49 \times h = 343 \times 3 \Rightarrow h = 21\text{ cm}$
$\therefore$ C.S.A. of cylinder $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 7 \times 21 = 44 \times 21 = 924\text{ cm}^2$

Note:- It can be done with the help of unit digit.

573. (b) Let, $x = 216\text{ cm}^2$, $y = 96\text{ cm}^2$, $z = 144\text{ cm}^2$

Volume $= \sqrt{xyz}$

$\Rightarrow \sqrt{216 \times 96 \times 144} = 8a^3$
$\Rightarrow 8a^3 = 1728 \Rightarrow a^3 = 216 \Rightarrow a = 6$
$\therefore$ Lateral surface area $= 4a^2 \times 3$
$= 4 \times 36 \times 3 = 432\text{ cm}^2$

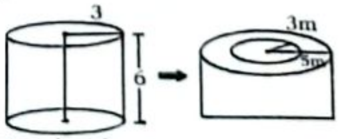
574. (c) Volume of cube $(a^3) = 729\text{ cm}^3$
Volume of cuboid
$= 5 \times 13 \times 31 = 2015\text{ cm}^3$
Total volume $= 2015 + 729 = 2744\text{ cm}^3$
Volume of new cube $(A^3) = 2744$
$\Rightarrow A = 14\text{ cm}$
$\therefore$ Total surface area of new cube $= 6A^2$
$= 6 \times 14^2 = 1176\text{ cm}^2$

575. (b) Number of candles

$= \frac{\text{Volume of cuboid}}{\text{Volume of cylindriod}} = \frac{LBH}{\pi r^2 h}$

$= \frac{70 \times 44 \times 20}{\frac{22}{7} \times 7 \times 7 \times 20} = 20$

576. (d)



r = 3m, h = 6m
width of embahkment = 2m
⇒ R = 3 + 2 = 5m
h = 6m
ATQ,
$\pi r^2 h_1 = \pi(R^2 - r^2)h_2$
$\Rightarrow 9 \times 6 = (5^2 - 3^2)h_2$
$\Rightarrow 54 = (25 - 9)h_2$

$\Rightarrow h_2 = \frac{54}{16} = 3\frac{3}{8}\text{ m}$

577. (c) Volume of earth taken out = πr^2h

$= \frac{22}{7} \times 14 \times 14 \times 23$

$= 44 \times 14 \times 23 = 14168\ cm^3$

Note:- To avoid last step calculations, use digital sum method.

$44 \times 14 \times 23 = 8 \times 5 \times 5 = 2$

option (c): 14168

Digital sum of 14168 = 2

Alternate Method:

Also, you can find multiple of 11. Option (c) satisfy.

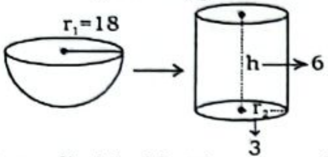
578. (c) Given,

Diameter of hemisphere = 36 cm

Radius of hemisphere (r_1) = 18 cm

Diameter of cylinder = 6 cm

Radius of cylinder (r_2) = 3 cm



Let n cylindrical bottle are required. Then,

∴ Volume of hemisphere

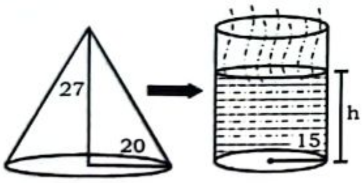
= n × volume of cylinder

$\Rightarrow \frac{2}{3}\pi r_1^3 = n \times \pi r_2^2 \times h$

$\Rightarrow \frac{2}{3} \times 18 \times 18 \times 18 = n \times 3 \times 3 \times 6$

$\Rightarrow n = 72$

579. (a)



$\Rightarrow \frac{1}{3} \times \pi r^2\ h = \pi r_1^2 h^1$

$\Rightarrow \frac{1}{3} \times \pi \times (20)^2 \times 27 = \pi \times (15)^2 \times h^1$

$\Rightarrow h^1 = 16\ cm$

580. (d) Given,

Radius of hemispherical bowl (R) = 6 cm

Radius of cylindrical bottle

$r = \frac{2}{2} = 1cm$

Height of cylindrical bottle (h) = 4 cm

∴ Number of required bottles

$= \frac{\text{Volume of bowl}}{\text{Volume of bottle}}$

$= \frac{\frac{2}{3}\pi R^3}{\pi r^2 h} = \frac{2R^3}{3r^2h}$

$= \frac{2 \times 6 \times 6 \times 6}{3 \times 1 \times 1 \times 4} = 36$

581. (a) ATQ,

Volume of liquid in Hemispherical Bowl = n × Volume of cylindrical bottle

$\Rightarrow \frac{2}{3}\pi R^3 = n \times \pi r^2\ h$

$\Rightarrow \frac{2}{3} \times 18^3 = n \times 3^2 \times 6$

$\Rightarrow n = 4 \times 18 = 72$

∴ The number of empty bottles = 72

582. (b) 1 minute = 50 liter

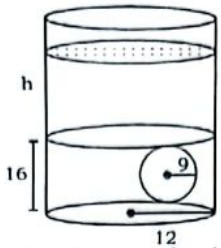
1 hr = 50 × 60 = 3000 liter

Now, $120m^3$ = 120000 liter

Then, [3000 liter → 1 hr]× 40

120000 liter → 40 hr

583. (d)

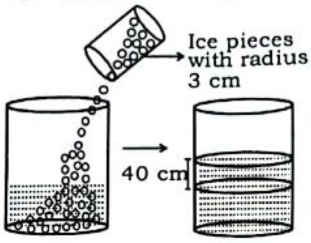


Let, the rise in water level be h cm. then, Volume of sphere = Volume of water risen.

$\Rightarrow \frac{4}{3}\pi(9)^3 = \pi \times (12)^2 \times h$

$\Rightarrow h = \frac{4}{3} \times \frac{9 \times 9 \times 9}{12 \times 12} \Rightarrow h = \frac{27}{4} = 6.75\ cm$

584. (a)



ATQ,

Let n Ice pieces are dropped

Volume of cylinder = n × Volume of spherical Ice pieces

$\Rightarrow \pi \times 9 \times 9 \times 40 = \frac{4}{3} \times \pi \times (3)^3 \times n$

$\Rightarrow n = \frac{9 \times 9 \times 40 \times 3}{3 \times 3 \times 3 \times 4} = 90$

585. (b) Volume of cube = a^3

$= 9 \times 9 \times 9 = 729$

$R = \frac{9}{2} = 4.5\ cm, h = 9\ cm$

Volume of cone

$= \frac{1}{3}\pi r^2h = \frac{1}{3} \times \frac{22}{7} \times 4.5 \times 4.5 \times 9$

$\therefore \text{Ratio} = \frac{729}{\frac{1}{3} \times \frac{22}{7} \times \frac{9}{2} \times \frac{9}{2} \times 9}$

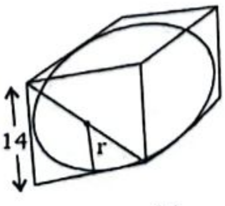
$= \frac{21 \times 4}{22} = \frac{42}{11}$

586. (c) The ratio of three volume (cone, cylinder, hemisphere)

= 20 : 50 : 30

= 2 : 5 : 3

587. (b)



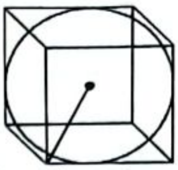
Radius of sphere = $\frac{14}{2}$ = 7 cm

Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$

$= \frac{88 \times 49}{3} = \frac{4312}{3} = 1437\ \frac{1}{3}\ cm^3$

588. (a)



Side of the cube = 14 cm

⇒ Diagonal of cube = $14\sqrt{3}$

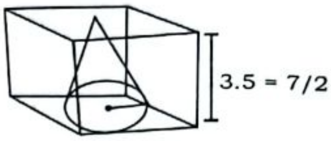
⇒ Radius of sphere = $\frac{14\sqrt{3}}{2} = 7\sqrt{3}$

∴ Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 7\sqrt{3} \times 7\sqrt{3} \times 7\sqrt{3}$

$= 88 \times 49\sqrt{3} = 4312\sqrt{3}$

589. (c)



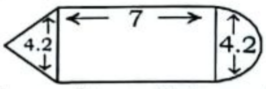
Radius of cone = $\frac{7}{4}$ cm

Height of cone = $\frac{7}{2}$ cm

Volume of cone = $\frac{1}{3}\pi r^2h$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times \frac{7}{2} = 11.23\ cm^3$

590. (c)



Volume of toy = Volume of cylinder + Volume of hemisphere + Volume of cone

$= \pi r^2h + \frac{2}{3}\pi r^3 + \frac{1}{3}\ \pi r^2h$

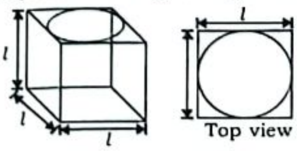
$= \pi r^2\ (h + \frac{2}{3}r + \frac{h}{3})$

$= \frac{22}{7} \times 4.2 \times 4.2 \times (7 + \frac{2}{3} \times 4.2 + \frac{7}{3})$

$= 672.672$

Note:- To avoid calculation, find the multiple of 11 in given option.

591. (c)



Radius of hemisphere = $\frac{4}{2} = 2\ cm$

Required surface area = T.S.A. of the cube – 6 × area of circle formed on the top of each face of the cube + 6 × C.S.A. of hemisphere formed on the each face of cube

$= 6 \times 10^2 - 6\pi \times 2^2 + 6 \times 2\pi \times 2^2$

$= 600 + 24\pi$

$= 600 + 24 \times \frac{22}{7} = 600 + \frac{528}{7}$

$= 600 + 75\frac{3}{7} = 675\frac{3}{7}\ cm^2$

592. (d) Length of largest possible rod in cubical room = $a\sqrt{3}$

$\Rightarrow a\sqrt{3} = 42\sqrt{3}$

$\Rightarrow a = 42$

Length of side of cube = Diameter of sphere

So, $d = 42$ m, $r = \frac{42}{2} = 21$ m

Total surface area of sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 21 \times 21 = 5544$ m^2

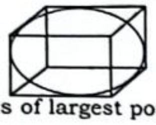
Note:-Answer must be a multiple of 11. Only option (d) satisfy.

593. (a) Radius of sphere = $\frac{7}{2}$ cm

Volume of sphere = $\frac{4}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^3$

$= 179.67$ cm^3

594. (a)



Radius of largest possible sphere

$= \frac{6}{2} = 3$ cm

Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 = \frac{792}{7}$ cm^3

595. (a) Radius of sphere = $\frac{\text{Edge}}{2} = 2.8$ cm

Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{5.6}{2} \times \frac{5.6}{2} \times \frac{5.6}{2} = 91.98$ cm^3

596. (c) Volume of wood : Volume of cone

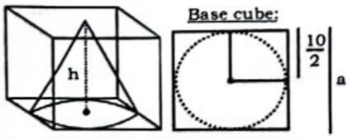
$\frac{4}{3}\pi(24)^3 : \frac{1}{3}\pi(21)^2 \times 42$

$1024 : 343$

Waste% $= \frac{1024-343}{1024} \times 100$

$= \frac{681}{1024} \times 100 = 66.50\%$

597. (a)



Height of cone = height of cube.

Radius of cone $= \frac{1}{2} \times$ width of cube.

Given, edge = 10 cm

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 5 \times 5 \times 10 = \frac{250}{3}\pi$

598. (c) Given,

$r = 7.5$cm, $h = 18$cm

Slant height of cone $(l) = \sqrt{r^2 + h^2}$

$= \sqrt{7.5^2 + 18^2} = 19.50$cm

Total surface area of remaining solid

= C.S.A of cylinder + C.S.A of cone + $\pi r^2 = 2\pi rh + \pi rl + \pi r^2$

$= \pi r(2h + l + r)$

$= \pi \times 7.5(36 + 19.50 + 7.5)$

$= 472.50\pi$ cm^2

599. (c) Let, the side of cube = 2

For cylinder

Height = 2, Radius = 1

Vol. of cube : Vol. of cylinder

$2 \times 2 \times 2 : \frac{22}{7} \times 1 \times 1 \times 2$

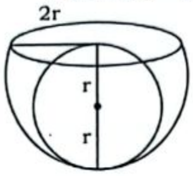
$14 : 11$

Remaining solid of wood = 3

Required% $= \frac{3}{14} \times 100$

$= 21.42\% - 21\%$

600. (c)



Vol. of sphere : Vol. of remaining

$\frac{4}{3}\pi \times r^3 : \frac{2}{3}\pi(2r)^3 - \frac{4}{3}\pi r^3$

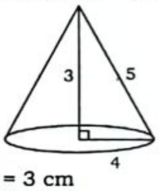
$\frac{4}{3}\pi r^3 : \frac{2}{3}\pi \times 8r^3 - \frac{4}{3}\pi r^3$

$\frac{4}{3}\pi r^3 : \frac{12}{3}\pi r^3$

$1 : 3$

$\therefore$ Required raito = 1 : 3

601. (b)



Height = 3 cm

and radius = 4 cm

$\therefore V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 4^2 \times 3 = 16\pi$ cm^3

$\therefore$ Volume of the cone = 16π cm^3

602. (d) Volume of cylinder = $\pi r^2 h$

Let,

$r_1 = 60$, $r_2 = 36$

$h_1 = 36$, $h_2 = 60$

ATQ,

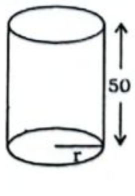
Volume of cylinder $\Rightarrow \pi r_1^2 h_1 : \pi r_2^2 h_2$

$\Rightarrow (60)^2 \times 36 : (36)^2 \times 60$

$\Rightarrow 60 : 36$

$\Rightarrow 5 : 3$

603. (b) When a rectangular piece of paper is rolled along its breadth to form a cylinder, then breadth behaves like circumference of base of cylinder.



$2\pi r = 22$

$\Rightarrow 2 \times \frac{22}{7} \times r = 22 \Rightarrow r = \frac{7}{2}$

$\therefore$ Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 50 = 11 \times 175$

$= 1925$ cm^3

Note:- To avoid last step calculations, use digital sum method.

$11 \times 175 = 2 \times 4 = 8$

option (b) = 1925

Digital sum of 1925 = 8

604. (b) T.S.A of prism = $3ah + 2 \times$ ar. of Δ

$= 3 \times 10 \times 10\sqrt{3} + 2 \times \frac{\sqrt{3}}{4} \times 100$

$= 350\sqrt{3}$ cm^2

605. (d) Total surface area of prism

$= \frac{151.20}{20} = 756$ cm^2

Let, height of prism = h.

Hypotenuse of right angle triangle =

$\sqrt{9^2 + 12^2} = 15$ cm.

Total surface area of prism = curved surface area + 2 × Area of base

$(\therefore$ Area of base $= 2 \times \frac{1}{2} \times 9 \times 12)$

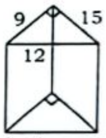
$\Rightarrow 756$ = perimeter of base × height

$\Rightarrow 756 = (9 + 12 + 15) \times h + 108$

$\Rightarrow 756 = 36 \times h + 108$

$\Rightarrow 36h = 648 \Rightarrow h = 18$ cm

606. (d)



Volume of prism = Area of base × h

$\Rightarrow 648 = \frac{1}{2} \times 9 \times 12 \times h \Rightarrow h = 12$ cm

$\therefore$ Height of prism = 12 cm

607. (d) (Perimeter of base) × h = T.S.A

$\Rightarrow 120 = 3 \times 4 \times h$

$\Rightarrow h = 10$cm

Volume of prism = Area of base × h

$= \frac{\sqrt{3}}{4} \times 4 \times 4 \times 10 = 40\sqrt{3}$ cm^3

608. (b) Volume of prism = base area × height

$\Rightarrow 160 = a^2 \times 10$

$\Rightarrow a^2 = 16 \Rightarrow a = 4$

side of square (a) = 4 cm.

Perimeter of square = $4a = 4 \times 4$

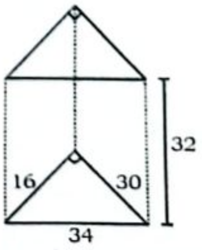
$= 16$ cm

$\therefore$ Total surface area of prism = curved surface area + 2 × area of base

$= 16 \times 10 + 2 \times 4 \times 4$

$= 160 + 32 = 192$ cm^2

609. (d)



lateral surface area of prism = perimeter × height = $(16 + 30 + 34) \times 32$

$= 2560$ cm^2

Volume of prism = area of base × height

$= \frac{1}{2} \times 30 \times 16 \times 32 = 7680$ cm^3

610. (c) Volume of prism = 1731.6 cm^3

$\Rightarrow$ Base area × height = 1731.6

$\Rightarrow \frac{1}{2}(11+15)\times 9\times h = 1731.6$

$\Rightarrow h = \frac{1731.6}{117} = 14.8cm$

611. (c) $h = 12\sqrt{3}$ cm, a = 5cm

Area of regular hexagon = $\frac{3\sqrt{3}a^2}{2}$

$= \frac{3\sqrt{3}\times 5^2}{2} = \frac{75\sqrt{3}}{2}\ cm^2$

$\therefore$ Volume = base area × height

$= \frac{75\sqrt{3}}{2}\times 12\sqrt{3} = 1350cm^3$

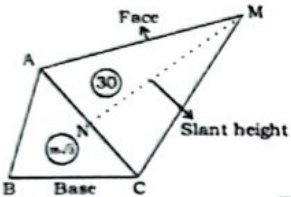
612. (c) 20, 21, 29 are triplets.
Area of base of prism

$= \frac{1}{2}\times 20\times 21 = 210$

Volume of prism = Area of base × h
$\Rightarrow$ 7560 = 210 × height $\Rightarrow$ Height = 36
$\therefore$ Lateral surface area of prism = Perimeter of base × height = (20 + 21 + 29) × 36 = 2520 cm^2

Note:- It can be done with the help of unit digit.

613. (c)



Area of equilateral $\Delta ABC = \frac{\sqrt{3}}{4}\times a^2$

$\Rightarrow \frac{\sqrt{3}}{4}\times a^2 = 16\sqrt{3}$

$\Rightarrow$ a = 8 (Side of base)

area of face ACM = $\frac{1}{2}\times 8\times h$

$\Rightarrow 30 = \frac{1}{2}\times 8\times h$

$\Rightarrow$ h (Slant height of pyramid)(MN) = $\frac{15}{2}$

In radius of base = $\frac{side}{2\sqrt{3}} = \frac{8}{2\sqrt{3}}$

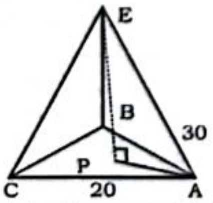
$= \frac{4}{\sqrt{3}}$ cm

Height of pyramid

$= \sqrt{(\text{slant height})^2 - (\text{inradius})^2}$

$\sqrt{\left(\frac{15}{2}\right)^2 - \left(\frac{4}{\sqrt{3}}\right)^2} = \sqrt{\frac{611}{12}}$

614. (d)



Let, h be the vertical height. Circum radius of equilateral $\Delta = \frac{a}{\sqrt{3}} = \frac{20}{\sqrt{3}}$

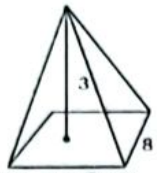
Now,

$h = \sqrt{AE^2 - AP^2} = \sqrt{30^2 - \left(\frac{20}{\sqrt{3}}\right)^2}$

$= \sqrt{900 - \frac{400}{3}} = \sqrt{\frac{2300}{3}}$

$h = 10\sqrt{\frac{23}{3}}cm$

615. (c)



h = 3 cm, a = 8 cm

$l^2 = h^2 + \left(\frac{a}{2}\right)^2 = 9 + 16 = 25 \Rightarrow l = 5$

$\therefore$ T.S.A. of Pyramid

$= \frac{1}{2}\times 4\times a\times l + a^2$

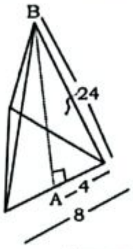
$= \frac{1}{2}\times 4\times 8\times 5 + 64$

= 80 + 64 = 144 cm^2

616. (a) Total surface area = lateral surface area + area of base
$\Rightarrow$ 340 = lateral surface area + 100
$\Rightarrow$ Lateral surface area = 240
$\because$ Area of each lateral face = 30cm^2

$\therefore$ No. of lateral face = $\frac{240}{30} = 8$

617. (b)



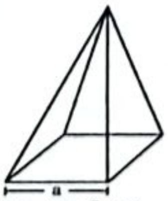
Height (AB) = $\sqrt{24^2 - 4^2}$

$= \sqrt{576-16} = 4\sqrt{35}$ cm

T.S.A of pyramid = C.S.A + Area of Base = $3\times\frac{1}{2}\times 8\times 4\sqrt{35} + \frac{\sqrt{3}}{4}\times(8)^2$

$= 48\sqrt{35} + 16\sqrt{3}\ cm^2$

618. (b)



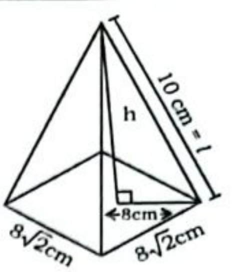
Given, a = 8 cm
T.S.A. of pyramid = 208 cm^2
$\Rightarrow$ L.S.A. + area of base = 208 cm^2

$\Rightarrow \left[\frac{1}{2}\times \text{perimeter of base}\times l\right]$ + area of base = 208

$\Rightarrow \left[\frac{1}{2}\times 4\times 8\times l\right] + (8\times 8) = 208$

$\Rightarrow 16\times l + 64 = 208\ cm^2 \Rightarrow l = 9$

619. (a)



Diagonal = $\sqrt{(8\sqrt{2})^2 + (8\sqrt{2})^2} = 16$ cm

$h = \sqrt{10^2 - 8^2} = 6cm$

$\therefore$ Volume of pyramid = $\frac{1}{3}$ × area of base × height = $\frac{1}{3}\times 8\sqrt{2}\times 8\sqrt{2}\times 6 = 256\ cm^3$

620. (a) Volume of pyramid = $\frac{1}{3}$ × Base area × height

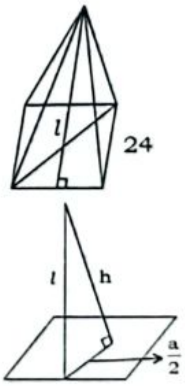
$\Rightarrow 45\sqrt{3} = \frac{1}{3}\times\frac{\sqrt{3}}{4}\times 6\times 6\times h$

$\Rightarrow$ h = 15

621. (b) Volume of pyramid = $\frac{1}{3}$ × area of base × h
Volume of prism = Area of base × h
$\therefore$ Required ratio

$= \frac{Ar\times h}{\frac{1}{3}\times Ar\times h} = \frac{3}{1} = 3:1$

622. (d)



$d = 24\sqrt{2}$

$\therefore$ Side of square (a) = 24

Lateral surface area = $4\times\frac{1}{2}\times 24\times l = 624$

$\Rightarrow l = \frac{624}{48} = 13$

Now, h = 5 cm [Pythagoras triplet] (12, 13, 5)

$\therefore$ Volume of pyramid = $\frac{1}{3}$ × area of base × height

$= \frac{1}{3}\times a^2\times h = \frac{1}{3}\times 24\times 24\times 5$

$= 24\times 40 = 960\ cm^3$

◆

27 Chapter

STATISTICS

MEAN

The mean of a given data is the sum of all observations divided by the number of observations. For example, a cricketer's scores in five ODI matches are as follows: 12, 34, 45, 50, 24. To find his average score we calculate the arithmetic mean of data using the mean formula:

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$\text{Mean} = \frac{12+34+45+50+24}{5}$$

$$= \frac{165}{5} = 33$$

Mean is denoted by $\bar{x}$ (pronounced as x bar).

MEAN OF GROUPED DATA

If $x_1, x_2, x_3, \ldots\ldots\ldots\ldots x_n$ are n values of a variable X, then the arithmetic mean or simply mean of these values is denoted by X and is defined as:

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \ldots\ldots\ldots\ldots x_n}{n} \text{ or}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

FOR DISCRETE FREQUENCY DISTRIBUTION

If X takes values $x_1, x_2, x_3 \ldots\ldots\ldots x_n$ with corresponding frequencies $f_1, f_2, f_3, \ldots\ldots\ldots, f_n$ respectively, then arithmetic mean of these values is given by:

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + f_3x_3 + \ldots\ldots\ldots\ldots f_nx_n}{f_1 + f_2 + f_3 + \ldots\ldots f_n}$$

$$\text{or } \bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{N} \text{ where } N = \sum_{i=1}^{n} f_i$$

$$= f_1 + f_2 + f_3 + \ldots\ldots f_n$$

1. The mean of the following data is ________, 23, 17, 20, 19, 21
(a) 20 (b) 19
(c) 23 (d) 21

2. If the mean of six observations 5, 7, 9, α, 11 and 12 is 9 then the value of α is :
(a) 10 (b) 15
(c) 22 (d) 25

3. The sum of deviations of a set of n values measured from 50 is −10 and the sum of - deviations of the values measured from 46 is 70. What is the mean of the values?
UPSC CDS-II 2022
(a) 48.5 (b) 49.0
(c) 49.5 (d) 50.0

4. The mean of five observations x, $x + 2$, $x + 4$, $x + 6$, $x + 8$ is m. What is the mean of the first three observation?
UPSC CDS-II 2020
(a) m (b) m − 1
(c) m - 2 (d) m − 3

5. If the mean of m observation out of n observations is n and the mean of remaining observations is m, then what is the mean of all n observation?
UPSC CDS-I 2019
(a) $2m - \frac{m^2}{n}$ (b) $2m + \frac{m^2}{n}$
(c) $m - \frac{m^2}{n}$ (d) $m + \frac{m^2}{n}$

6. The mean of p, q, r, s and t is 280. If the mean of p, r and t is 240, what is the mean of q and s?
UPSC CDS-II 2023
(a) 310 (b) 320
(c) 330 (d) 340

7. What is the algebraic sum of the deviations from the mean of a set of values 25, 65, 73, 75, 83, 76, 17, 15, 7, 14?
UPSC CDS-II 2020
(a) −1 (b) 0
(c) 1 (d) 2

8. Find the mean of the following distribution:

x	4	6	9	10	15
f	5	10	10	7	8

(a) 9 (b) 10
(c) 12 (d) 8

9. If the mean of the following distribution is 6, find the value of p.

x	2	4	6	10	p + 5
f	3	2	3	1	2

(a) 7 (b) 8
(c) 9 (d) 10

10. If the mean of the following data is 61 then what is the value of

xi	55	60	70	95
fi	48	X	31	23

RRB JEE (18/12/2024)
(a) 796 (b) 799
(c) 773 (d) 790

11. Find the mean marks from the following distribution.

Score	Number of students
83	9
73	5
20	18
82	16

RRB JEE (16/12/2024)
(a) 78 (b) 58
(c) 50 (d) 57

12. If the mean of the following data is 15, then find the value of k.

(x)	5	10	15	20	25
(f)	6	k	6	10	5

(a) 8 (b) 10
(c) 7 (d) 6

13. Find the mean of the following frequency distribution:

Class Interval	No. of workers (f)
0-10	7
10-20	10
20-30	15
30-40	8
40-50	10

(a) 25.8 (b) 24.8
(c) 25.9 (d) 24.9

14. If the mean of the following data is 40, then what is the value of

Class Interval	Frequency
5-15	12
15-25	18
25-35	8
35-45	14
45-55	16
55-65	8

RRB JEE (17/12/2024)
(a) 43.72 (b) 39.45
(c) 22.38 (d) 33.68

15. The mean of the following distribution is 26, then what is the value of k?

Class	Frequency
0-10	8
10-20	10
20-30	K
30-40	6
40-50	12

(a) 8 (b) 1
(c) 4 (d) 10

16. Consider the following grouped frequencecy distribution:

x	f
0-10	8
10-20	12
20-0	10
30-40	p
40-50	9

If the mean of the above data 25.5, then what is the value of p

UPSC CDS-I 2019

(a) 9
(b) 10
(c) 11
(d) 12

17. Find the arithmetic mean of the following frequency distribution by the assumed mean method:

Class Interval	Frequency
50-150	16
150-250	10
250-350	22
350-450	15
450-550	12

(a) 290
(b) 296
(c) 285
(d) 250

18. The mode and median of a data are 19.5 and 85 respectively. What will be the mean of the data? (Use the root ratio formula.)

RRB Tech.Grade-I (19/12/2024)

(a) 118
(b) 118.6
(c) 119.1
(d) 117.8

19. Mode and median of a data 26.7 and 71 respectively. What will be the mean of the data? (Use the root ratio formula.)

RRB Tech.Grade-I (20/12/2024)

(a) 94.3
(b) 93.2
(c) 95.1
(d) 94.6

MEDIAN

The value of the middle most observation, obtained after arranging the data in ascending or descending order, is called the median of the data.

For example, consider the data: 4, 4, 6, 3, 2.

Let's arrange this data in ascending order: 2, 3, 4, 4, 6.

There are 5 observations.

Thus, median = middle value i.e. 4.

HOW TO FIND MEDIAN

STEP-I : Arrange the observations $x_1, x_2, \ldots\ldots\ldots\ldots x_n$ in ascending or descending order of magnitude.

STEP-II : Determine the total number of observations, say, n

STEP-III : If n is odd, then median is the value of $\left(\frac{n+1}{2}\right)^{th}$ observation.

If n is even, then median is the arithmetic mean of the values of $\left(\frac{n}{2}\right)^{th}$ and $\left(\frac{n}{2}+1\right)^{th}$ observations.

MEDIAN OF DISCRETE FREQUENCY DISTRIBUTION

STEP-I : Find the cumulative frequencies (c.f.)

STEP-II : Find $\frac{N}{2}$, where $N = \sum_{i=1}^{n} f_i$

STEP-III: See the cumulative frequency (c.f.) just greater than $\frac{N}{2}$ and determine the corresponding value of the variable.

STEP-IV: The value obtained in step III is the median.

MEDIAN OF A DISCRETE SERIES

STEP-I: Arrange the values of the variate in ascending or descending order

STEP-II: Prepare a cumulative frequency table

STEP-III: Median is the observation whose cumulative frequency is equal to or just greater than $\frac{N}{2}$, where N is sum of frequencies.

MEDIAN OF A CONTINUOUS SERIES

STEP-I: Prepare the cumulative frequency table

STEP-II: Find the median class, i.e. the class whose cumulative frequency is equal or just greater than $\left(\frac{N}{2}\right)$

STEP-III: The median value is given by the formula

$$\text{Median} = l + \left(\frac{\left(\frac{N}{2}\right) - cf^{-}}{f}\right) \times h$$

Where,

l = Lower limit of the median class

N = Total frequency

f = Frequency of the median class

h = Width of the median class

cf^{-} = Cumulative frequency of the class preceding the median class

Let's take an example on finding median of continuous data, that is the only case where finding median is sometimes challenging

20. The median of the following data will be __________.

32, 25,33,27, 35, 29 and 30

SSC CGL TIER-II 03/03/2023

(a) 32
(b) 27
(c) 30
(d) 29

21. The weights (in kg) of 7 cousins in a family are 54, 62, 65, 70, 60, 59, 55. Find the median weight.

SSC CHSL TIER-II (18/11/2024)

(a) 60 kg
(b) 61 kg
(c) 70 kg
(d) 61.5 kg

22. The following are the marks of 9 students in a class. Find the median.

34, 32, 48, 38, 24, 30, 27, 21, 35

(a) 24
(b) 32
(c) 38
(d) 21

23. The age of some students is given in years as 12, 13, 16, 18,14, 19, 13, 17, 15 and 11. The median age (in years) of the students is:

SSC CGL TIER-II (20/01/2025)

(a) 13.5
(b) 14
(c) 15
(d) 14.5

24. Taken by a bowler in 10 cricket matches Wickets taken are 2, 6, 4, 5, 0, 3, 1, 3, 2, 3. What is the median of the given data?

RRB Tech.Grade-III (27/12/2024)

(a) 2
(b) 3
(c) 1
(d) 0

25. What is the median of the following data?

2, 3, −1, 2, 6, 8, 9

UPSC CDS-I 2021

(a) 2
(b) 3
(c) 4
(d) 5

26. Fifteen candidates appeared in an examination. The marks of the candidates who passed in the examination are 9, 6, 7, 8, 8, 9, 6, 5, 4 and 7. What is the median of marks of all the fifteen candidates?

UPSC CDS-II 2020

(a) 6
(b) 6.5
(c) 7
(d) 7.5

27. The median of a set of observations 15, 16, 18, 22, $x+2$, $x+3$, 26, 27, 30 arranged in ascending order is 24, then find the value of x.

(a) 26
(b) 25
(c) 20
(d) 22

28. The following observations are arranged in ascending order.

29, 32, 48, 50, x, $2x+3$, 72, 78, 84, 95

If the median is 63, find the value of x.

RRB Tech.Grade-III (24/12/2024)

(a) 63
(b) 62
(c) 41
(d) 51

29. The median of observations $k-\frac{3}{2}$, $k+2$, $k-1$, $k+4$, $k+\frac{1}{2}$, $k-3$, $k+4\frac{1}{2}$ is _____.

NTPC 01/04/2021 (Shift-03)

(a) $k-\frac{3}{2}$
(b) $k+\frac{1}{2}$
(c) $k-1$
(d) $k+2$

30. The median of 19 observations is 30. Two more observations are made and the values of these are 8 and 32. What is the median of the 21 observations ?

UPSC CDS-II 2018

(a) 32
(b) 30
(c) 20
(d) Cannot be determined due to insufficient data

31. If 88 is replaced by 93 and 41 is replaced by 47 in following observations, 46, 48, 63, 76, 88, 41, 35, 55, 90, 56, 92 then what would be the difference between the new median and the previous median?

SSC CHSL TIER-II (18/11/2024)

(a) 0 (b) 1
(c) 2 (d) 3

32. The median of a set of 11 distinct observations is 73.2. If each of the largest five observations of the set is increased by 3, then the median of the new set:

SSC CGL TIER-II 07/03/2023

(a) Is 3 times that of the original set
(b) Is increased by 3
(c) Remains the same as that of the original set
(d) Is decreased by 3

33. Find the sum of deviations of the values of data sets 5, 6, 7, 9, 10, 12 and 14 from the mean of the values given in the same data set.

RRB Tech.Grade-III (30/12/2024)

(a) 3 (b) –1
(c) 2 (d) 0

34. If the mode of any data is 16.2 more than its mean, then use the empirical formula for taking the mode from the mean.)

RRB Tech.Grade-III (23/12/2024)

(a) 10.2 (b) 8.25
(c) 10.8 (d) 12.4

35. If the median of any number is 24.12 less than its mode, then the median of the data will be ______ greater than its mean. (Use empirical formula to find the answer.)

RRB Tech.Grade-III (27/12/2024)

(a) 8.04 (b) 6.03
(c) 12.06 (d) 16.08

36. Obtain the median for the following frequency distribution:

x	1	2	3	4	5	6	7	8	9
f	8	10	11	16	20	25	15	9	6

(a) 3 (b) 5
(c) 7 (d) 10

37. Consider the following frequencey distribution:

x	8	5	6	10	9	4	7
f	6	4	5	8	9	6	4

What is the median for the distribution?

UPSC CDS-I 2019

(a) 6 (b) 7
(c) 8 (d) 9

38. Find the median of the following data. (Rounded off to 2 decimal places.)

Class Interval	Frequency
0 - 5	3
5 - 10	5
10 - 15	4
15 - 20	2
20 - 25	7
25 - 30	6
30 - 35	5

SSC CGL TIER-II (18/01/2025)

(a) 21.43 (b) 23.40
(c) 20.53 (d) 18.64

39. Find the median of the following data.

Class (CI)	Frequency (f)
0-10	8
10-20	3
20-30	7
30-40	4
40-50	10
50-60	1
60-70	3
70-80	5
80-90	2
90-100	4

(a) 38 (b) 40
(c) 35 (d) 41.5

40. Calculate the median from the following distribution:

Class	Frequency
5-10	5
10-15	6
15-20	15
20-25	10
25-30	5
30-35	4
35-40	2
40-45	2

(a) 17.4 (b) 18.4
(c) 14.2 (d) 19.5

41. Median, for the following distribution is

Wages (Rs.)	Number of labour
0-10	22
10-20	38
20-30	46
30-40	35
40-50	20

(a) 36.24 (b) 24.46
(c) 28.36 (d) 32.26

42. If average weekly wages earned by a worker is 3,520, then what is the value of k?

Weekly wages	Number of workers
2050 – 2550	5
2550 – 3050	10
3050 – 3550	k
3550 – 4050	8
4050 – 4550	2
4550 – 5050	10

UPSC CDS-II 2023

(a) 10 (b) 12
(c) 15 (d) 20

43. What is the difference between mean and median of the given data.

6, 8, 5, 7, 12, 16, 6, 8, 13

(a) 4 (b) 2
(c) 1 (d) 1.5

MODE

The mode or modal value of a distribution is that value of the variable for which the frequency is maximum.

Relation between Mean, Median & Mode

Mode = 3(Median) – 2(Mean)

COMPUTATION OF MODE FOR A CONTINUOUS FREQUENCY DISTRIBUTION

Computation of mode is done by the following formula

$$\text{Mode } (M_0) = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

l = Lower limit of class

f_1 = Frequency of modal class

f_0 = Frequency of the class just preceding to the modal class

f_2 = Frequency of the class just following of the modal class

h = Class width of modal class

44. What is the mode of the given data?

5, 7, 9, 7, 3, 7, 5, 7, 8, 6, 7

SSC CGL TIER-II 07/03/2023

(a) 7 (b) 6
(c) 5 (d) 3

45. Find the mode of the following data:

25, 16, 19, 48, 19, 20, 34, 15, 19, 20, 21, 24, 19, 16, 22, 16, 18, 20, 16, 19

(a) 16 (b) 19
(c) 20 (d) 22

46. What is the mode of the following data?

66, 69, 83, 69, 84, 74, 71, 83, 69, 84, 73, 83, 69, 71, 84, 74, 83, 66, 74, 71, 83, 66, 90, 90

RRB Tech.Grade-III (29/12/2024)

(a) 74 (b) 90
(c) 84 (d) 83

47. What will be the mode of the following data?

13, 15, 31, 12, 27, 13, 27, 30, 27, 28 and 16

SSC CGL TIER-II 06/03/2023

(a) 28 (b) 31
(c) 30 (d) 27

48. Mean of a sample data = 60 and median = 48. Find the mode of this distribution.

SSC CGL TIER-II 06/03/2023

(a) 36 (b) 18
(c) 24 (d) 48

49. Find the sum of the mean, median and mode of the given data.

9, 35, 20, 25, 25, 15, 25

NTPC 30/01/2021 (Shift-01)

(a) 50 (b) 47
(c) 75 (d) 72

50. Using empirical formula, calculate the mode for the following data.
17, 20, 21, 18, 25, 28, 24, 22, 16, 24, 25, 24

SSC CGL TIER-II (18/01/2025)

(a) 25.8 (b) 32
(c) 25 (d) 30.6

51. The wickets taken by a bowler in 10 cricket matches are 2, 6, 4, 5, 0, 2, 1, 3, 2, 3. What is the mode of these data?

RRB Tech.Grade-III (28/12/2024)

(a) 0 (b) 1
(c) 3 (d) 2

52. If the mode of the following data is 6 then find the value of k.
2, 4, 6, 7, 5, 6, 10, 6, 7, 2k + 1, 9, 7, 13

RRB Tech.Grade-III (23/12/2024)

(a) 3.5 (b) 3
(c) 2.5 (d) 2

53. The mode for the above grouped frequency distribution is-

Category	Frequency
0-10	6
10-20	10
20-30	20
30-40	5
40-50	2

(a) 25 (b) 26
(c) 24 (d) 29

54. Find the mode for the given distribution (rounded off to two decimal places).

Class Interval	Frequency
5-10	8
10-15	7
15-20	6
20-25	9
25-30	11
30-35	10

SSC CGL TIER-II 02/03/2023

(a) 35.25
(b) 40.25
(c) 30.33
(d) 28.33

55. Given below is the distribution of 48 students present in the class on the basis of their attendance (days):

Number of days of Attendance	Number of Students
6-10	7
10-14	13
14-18	18
18-22	8
22-26	2

Find the mode

(a) 15.29 (b) 15.33
(c) 15.60 (d) 16.50

56. For the following grouped frequency distribution, find the mode:

Class	Frequency
3-6	2
6-9	5
9-12	10
12-15	23
15-18	21
18-21	12
21-24	3

(a) 18.3 (b) 14.6
(c) 15.4 (d) 12.5

57. Given below is the data of the age of the various children.

Age (years) (X)	Number of Children (F)
9	1
12	6
5	9
8	7
7	4
6	3

What is the difference between the mean and mode of the ages?

(a) 2.6 (b) 2.5
(c) 3.5 (d) 3.6

RANGE

Difference between highest and lowest numbers, is called Range.

HOW TO FIND THE RANGE:

(i) Arrange the numbers in ascending order.

(ii) Subtract the lowest value from the largest.

Range = largest value – smallest value

58. What is the range of the following data?
35, 40, 25, 27, 38, 45, 50, 65

(a) 44 (b) 45
(c) 38 (d) 40

59. Find the range of 12, 22, 7, 1, 5, 27, 30, 43.

(a) 28 (b) 48
(c) 35 (d) 42

60. A set of data presented in the form of a frequency distribution table with class intervals and their respective frequencies had a mode of 48.5. The lower boundary of the modal class was 46.5; the frequency of the modal class was 34; the frequency of the class interval just preceding the modal class was 32 and the frequency of the class interval just succeeding the modal class was 25. What was the width of the modal class?

(a) 11 (b) 12
(c) 13 (d) 14

61. Calculate the range for the given frequency distribution.

Class Interval	Frequency
10–20	2
20–30	3
30–40	14
40–50	8
50–60	3
60–70	8
70–80	2

(a) 50 (b) 70
(c) 60 (d) 55

Directions for the following two items:

Read the following frequencey distribution for two series of observation for two series of observation and answer the two items that follow:

Class Interval	Frequency	
	Series -I	Series -II
10-20	20	4
20-30	15	8
30-40	10	4
40-50	x	$2x$
50-60	y	y
Total	100	100

62. What is the mean of frequency distribution of series-I?

UPSC CDS-II 2019

(a) 33.6 (b) 35.6
(c) 37.6 (d) 39.6

63. What is the mode of the frequency distribution of Series-II?

UPSC CDS-II 2019

(a) 26 (b) 36
(c) 46 (d) 56

VARIANCE

Variance is a measure of variability in statistics. It assesses the average squared difference between data values and the mean. It is denoted by sigma (σ^2).

➢ **How to compute variance and standard deviation?**

STEP-I: Compute the simple mean $\bar{x}$.

STEP-II: Calculate the difference of $x_i - \bar{x}$, for each value in the data set.

STEP-III: Calculate the squared difference $(x_i - \bar{x})$, for each value in the data set.

STEP-IV: Sum of Differences of the squares $\sum_{i=1}^{n}(x_i - \bar{x})^2$.

STEP-V: Divide the sum of squared differences with n,

$$\text{variance } (\sigma^2) = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

Note: If we add/subtract from the given numbers there will be no change in variance & if we multiply by z to the given numbers by then variance will becomes z^2 times.

➢ Variance of first n natural number is $\frac{(n^2-1)}{12}$

➢ Variance of first n even/odd natural number is $\frac{n^2-1}{3}$

64. Calculate the variance from the following data.
3, 6, 5, 2, 4
NTPC 02/03/2021 (Shift-03)
(a) 3 (b) 2
(c) 2.2 (d) 2.5

65. Calculate the variance for the following data:
2, 5, 6, 8, 9
NTPC 19/03/2021 (Shift-03)
(a) 3 (b) 4
(c) 6 (d) 5

66. The variance of the seven observations 6, 7, 10, 12, 13, 8, 14 is:
NTPC 19/03/2021 (Shift-01)
(a) 9 (b) 9.25
(c) 8.50 (d) 8.29

67. The variance of 20 observations is 5. If each observation is multiplied by 2, then the variance of the resulting observation will be:
NTPC 10/02/2021 (Shift-03)
(a) 5 (b) 2 × 5
(c) $2^2 \times 5$ (d) 2×5^2

68. If the variance of 10 observations is 6 & each observation is multiplied by 3 then new variance is:
(a) 56 (b) 58
(c) 54 (d) 52

69. The mean and variance of 10 observations are found to be 10 and 4 respectively. On rechecking it was found that an observation 8 was incorrect. If it is replaced by 18, then the correct variance is.
(a) 12 (b) 9
(c) 15 (d) 6

70. The standard deviation of 12 values is 3. If each value is increased by 4, then find the variance of the new set of values.
NTPC 29/01/2021 (Shift-01)
(a) 7 (b) 16
(c) 25 (d) 9

STANDARD DEVIATION

If σ^2 is the variance, then σ is called the standard deviation.

Standard Deviation $(\sigma) = \sqrt{\text{variance}}$

◈ **What is Mean Deviation**

The mean deviation of a given standard distribution is the average of the deviation from the central tendency. Central Tendency can be computed using the Arithmetic Mean, Median or Mode of the data. It is used to show how far the observations are situated from the central point of the data (the central point can be either mean, median or mode).

71. If the variance of 5 value is 0.81, then what is its standard deviation?
SSC MTS 26/10/2021 (Shift-01)
(a) 0.09 (b) 0.9
(c) 2.7 (d) 0.27

72. Calculate the standard deviation for the following data.
3, 4, 5, 6, 7
NTPC 14/03/2021 (Shift-01)
(a) $\sqrt{6}$ (b) $\sqrt{3}$
(c) $\sqrt{2}$ (d) 2

73. Find the standard deviation of the following data (rounded off to two decimal places).
5, 3, 4, 7
SSC CGL TIER-II 03/03/2023
(a) 1.49
(b) 3.21
(c) 4.12
(d) 2.45

74. Calculate the standard deviation for the following data.
4, 7, 9, 10, 15
NTPC 12/03/2021 (Shift-01)
(a) 2.733 (b) 3.133
(c) 3.533 (d) 3.633

MEAN DEVIATION ABOUT MEAN

The mean deviation about mean is defined as a statistical measure that is used to calculate the average deviation from the mean value of the given data set.

Ungrouped data M.D.

$$= \frac{\Sigma_1^n |X_i - \text{Mean}|}{n}$$

Coefficient of M. D. $= \frac{\text{M.D.}}{\overline{X}}$; where $\overline{X}$ is Mean

The mean deviation of the data values can be easily calculated using the below procedure.

STEP-I: Find the mean value for the given data values

STEP-II: Now, subtract the mean value from each of the data values given (Note: Ignore the minus symbol)

STEP-III: Now, find the mean of those values obtained in step 2.

75. Find the coefficient of mean deviation from the following data:
3, 8, 7, 6, 5, 1
(a) 0.4 (b) 0.5
(c) 0.3 (d) 0.6

76. Compute Coefficient of M.D. from median for following series.
3, 7, 12, 14, 15, 18, 22
(a) 0.446 (b) 0.556
(c) 0.336 (d) 0.666

77. Determine the mean deviation for the data values 5, 3, 7, 8, 4, 9.
(a) 1 (b) 2
(c) 2 (d) 2.5

78. Calculate the mean deviation from mean for the following frequency distribution:

Variable (x)	10	30	50	70	90
Frequency (f)	4	24	28	16	8

(a) 12 (b) 16
(c) 18 (d) 24

79. Find the minimum possible number of the mean deviations from the following data.

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	4	5	3	6	2

(a) 5 (b) 7
(c) 9 (d) 3

MEAN DEVIATION ABOUT MEDIAN

The mean deviation about median is defined as a statistical measure that is used to calculate the average deviation from the median value of the given data set.

Ungrouped data M.D.

$$= \frac{\Sigma_1^n |X_i - \text{Median}|}{n}$$

Coefficient of M.D. $= \frac{\text{M.D.}}{\text{M}}$; Where M is Median

The mean deviation of the data values can be easily calculated using the below procedure.

STEP-I: Find the Median for the given data values

STEP-II: Now, subtract the median from each of the data values given (Note: Ignore the minus symbol)

STEP-III: Now, find the mean of those values obtained in step 2.

Note: Mean deviation is minimum about Median.

80. The mean deviation about median for the given data:
52, 56, 66, 70, 75, 80, 82 is:
SSC CGL TIER-II (JSO) 14/09/2019
(a) 9 (b) 7
(c) 3 (d) 6

81. Find the mean deviation about the median for the following data:
4, 6, 9, 3, 10, 13, 2
(a) 3.28 (b) 6
(c) 3 (d) 3.18

MEAN DEVIATION ABOUT MODE

The mean deviation about mode is defined as a statistical measure that is used to calculate the average deviation from the mode value of the given data set.

Ungrouped data M.D.

$$= \frac{\Sigma_1^n |X_i - \text{Mode}|}{n}$$

Coefficient of M.D. = $\frac{\text{M.D.}}{\text{Z}}$; Where Z is Mode.

The mean deviation of the data values can be easily calculated using the below procedure.

STEP-I: Find the mode for the given data values

STEP-II: Now, subtract the mode from each of the data values given (Note: Ignore the minus symbol)

STEP-III: Now, find the mean of those values obtained in step 2.

82. The mean deviation about mode for the given data:
7, 4, 10, 9, 15, 12, 7, 9, 7 is:
(a) 2.36
(b) 2.56
(c) 2.16
(d) 3.56

COEFFICIENT OF VARIATION

It is describe variability by expressing the standard deviation as a proportion of mean, usually a percentage.

The formula for it as a percentage is

Coefficient of variation

$$= \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

83. If the mean is 25 and the standard deviation is 5 then the coefficient of variation is:

NTPC 07/01/2021 (Shift-03)

(a) 20%
(b) 48%
(c) 60%
(d) 27%

84. If the standard deviation of a set of numbers is 3 and the arithmetic mean of these numbers is 6, what is the coefficient of variation of these numbers?

NTPC 08/04/2021 (Shift-01)

(a) 125%
(b) 75%
(c) 50%
(d) 100%

ANSWER KEY

1.	(a)	2.	(a)	3.	(c)	4.	(c)	5.	(a)	6.	(d)	7.	(b)	8.	(a)	9.	(a)	10.	(c)
11.	(b)	12.	(a)	13.	(a)	14.	(d)	15.	(c)	16.	(c)	17.	(b)	18.	(d)	19.	(b)	20.	(c)
21.	(a)	22.	(b)	23.	(d)	24.	(b)	25.	(b)	26.	(a)	27.	(d)	28.	(d)	29.	(b)	30.	(b)
31.	(a)	32.	(c)	33.	(d)	34.	(c)	35.	(d)	36.	(b)	37.	(c)	38.	(a)	39.	(d)	40.	(d)
41.	(b)	42.	(c)	43.	(c)	44.	(a)	45.	(b)	46.	(d)	47.	(d)	48.	(c)	49.	(d)	50.	(c)
51.	(d)	52.	(c)	53.	(c)	54.	(d)	55.	(b)	56.	(b)	57.	(a)	58.	(d)	59.	(d)	60.	(a)
61.	(b)	62.	(c)	63.	(c)	64.	(b)	65.	(c)	66.	(d)	67.	(c)	68.	(c)	69.	(b)	70.	(d)
71.	(b)	72.	(c)	73.	(a)	74.	(d)	75.	(a)	76.	(c)	77.	(c)	78.	(b)	79.	(b)	80.	(a)
81.	(a)	82.	(b)	83.	(a)	84.	(c)												

SOLUTIONS

1. (a) Mean ($\bar{x}$) =

$$\frac{23+17+20+19+21}{5} = \frac{100}{5} = 20$$

Alternate Method:

Let the mean of given data = 20

$$\begin{bmatrix} 23, & 17, & 20, & 19, & 21 \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ +3, & -3, & 0, & -1, & +1 \end{bmatrix}$$

Deviation = +3, − 3 & − 1, + 1

Here, Average of deviation = 0

∴ Mean = 20

2. (a) Mean($\bar{x}$)

$$= \frac{5+7+9+\alpha+11+12}{6} = 9$$

$\Rightarrow 44 + \alpha = 54 \Rightarrow \alpha = 10$

Alternate Method:

Let the mean of given data = 9

Deviation = −4, − 2, x, + 2, + 3

$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$\therefore \alpha = 9 + x = 9 + 1 = 10$

3. (c) **Important Formula:**

Sum of Deviation = $(x_1 - \text{d}) + (x_2 - \text{d}) + \ldots.. + (x_n - \text{d}) = \sum_{i=1}^{n} x_i$

mean = $\frac{1}{\text{n}}\left(\sum_{i=1}^{n} x_i\right)$

According to the question,

The sum of deviations of a set of 'n' values measured from 50 = −10

$\Rightarrow \sum_{i=1}^{n} x_i - 50\text{n} = -10$ ....(i)

The sum of deviations of the values measured from 46 = 70

$\Rightarrow \sum_{i=1}^{n} x_i - 46\text{n} = 70$ .....(ii)

On subtracting eq. (ii) from eq. (i) we get

$\Rightarrow -4\text{n} = -80$

$\Rightarrow \text{n} = 20$

Now, from eq. (i) we get

$\Rightarrow \sum_{i=1}^{n} x_i - 50(20) = -10$

$\Rightarrow \sum_{i=1}^{n} x_i = 900$

Now, the value of mean

$$= \frac{1}{\text{n}} \sum_{i=1}^{n} x_i = \frac{1}{20} \times 990$$

Hence, the mean of the values is 49.5

4. (c) Observations are: x, $x + 2$, $x + 4$, $x + 6$, $x + 8$

As we can see these observations consecutive number series with a gap of 2. are

We know that,

In a consecutive number series, the middle number is the mean.

So, $(x + 4)$ = m (given mean)

The first three observations are :- x, $x + 2$, $x + 4$ So, $(x + 2)$ is mean here which is two less then $(x + 4)$

∴ The mean of first three observations is m − 2.

5. (a) So, n observations are

a_1, a_2, a_3, -------- a_m -------- a_n

mean of "m" observation is "n"

$$= \frac{a_1 + a_2 + a_3 \ldots..a_m}{m} = n \quad \ldots.. \text{(I)}$$

& mean of remaining observation is m so number of such observation are n − m

$$\text{Mean} = \frac{a_{m+1} + \ldots + a_n}{n - m} = m \quad \ldots.. \text{(II)}$$

by rearranging & adding equation (1) & (2)

$a_1 + a_2 + \ldots.. a_{m+1} \ldots... + a_n$

$= nm + m(n - m)$

$= 2mn - m^2$

So total observation is "n"

$$\text{so mean} = \frac{2mn - m^2}{n}$$

$$= 2m - \frac{m^2}{n}$$

For next 2 question:

From series - I we get:-

$\Rightarrow 20 + 15 + 10 + x + y = 100$

$\Rightarrow x + y = 100 - 45$

$\Rightarrow x + y = 55$ ....(i)

From series - II we get:-

$\Rightarrow 4 + 8 + 4 + 2x + y = 100$

$\Rightarrow 2x + y = 100 - 16$

$\Rightarrow 2x + y = 84$ .... (ii)

On subtracting eq. (i) from eq. (ii) we get,

$\Rightarrow 2x + y - x - y = 84 - 55$

$\Rightarrow x = 29$ Putting $x = 29$ in eq. (i) we get,

$\Rightarrow 29 + y - 55$

$\therefore y = 26$

6. (d) Given,

$$\frac{p+q+r+s+t}{5} = 280$$

$p + q + r + s + t = 1400$ ...(1)

$$\frac{p+r+t}{3} = 240$$

$p + r + t = 720$ ...(2)

put (2) in (1)

$q + s + 720 = 1400$

$q + s = 680$

$\therefore$ Mean of q and s $= \frac{680}{2} = 340$

Alternate Method:-

$\underbrace{p,\ r,\ t,}_{240}\ \underbrace{q,\ r}_{\frac{+120}{2} = +60} = 280$

$240 \downarrow$

-40×3

$-120 \qquad +120$

$\therefore$ mean $= 280 + 60 = 340$

7. (b) We know that,

$$\text{mean} = \frac{\text{sum of values}}{\text{number of values}}$$

$$= \frac{25 + 65 + 73 + 75 + 83 + 76 + 17 + 15 + 7 + 14}{10}$$

$$= \frac{450}{10} = 45$$

Now,

Deviation from mean = (45 – 25), (45 – 65), (45 – 73), (45 – 75), (45 – 83), (45 – 76) (45 – 17), (45 – 15), (45 – 7), (45 – 14)

= 20, –20, –28, –30, –38, –31, 28, 30, 38, & 31.

Sum of deviations = 20 – 20 – 28 – 30 – 38 – 31 + 28 + 30 + 38 + 31 = 0

$\therefore$ The algebraic sum of the deviations from the mean is 0.

8. (a)

f	x	f_ix_i
5	4	20
10	6	60
10	9	90
7	10	70
8	15	120
$\Sigma f_i = 40$		$\Sigma f_ix_i = 360$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f_ix_i}{\Sigma f_i} = \frac{360}{40} = 9$$

Alternate Method:

Let the mean of given data = 9

Deviation = – 5, – 3, 0, + 1, + 6

$$D_{avg} = \frac{-25 - 30 + 7 + 48}{40} = 0$$

$\therefore$ Mean = 9

9. (a)

x	f	f_ix_i
2	3	6
4	2	8
6	3	18
10	1	10
p + 5	2	2p + 10
	$\Sigma f = 11$	$\Sigma f_ix_i = 52 + 2p$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f_ix_i}{\Sigma f_i} = \frac{52 + 2p}{11} = 6$$

$\Rightarrow 2p = 14 \Rightarrow p = 7$

10. (c)

x_i	f_i	f_ix_i
55	48	2640
60	x	$60x$
70	31	2170
95	23	2185

$102 + x \quad \Sigma f_ix_i = (6995 + 60x)$

$$\text{Mean} = \frac{6995 + 60x}{102 + x}$$

$61 \times (102 + x) = 6995 + 60x$

$x = 6995 - 6222$

$= 773$

11. (b)

Marks (x)	Number of students(f)	f × x
83	9	74.7
73	5	365
20	18	360
82	16	1312

$\Sigma f = 48 \quad \Sigma f \times x = 2784$

$$\text{Mean} = \frac{\Sigma f \times x}{\Sigma f} = \frac{2784}{48} = 58$$

12. (a)

f	x	f_ix_i
6	5	30
k	10	10k
6	15	90
10	20	200
5	25	125
$\Sigma f_i = 27 + k$		$\Sigma f_ix_i = 445 + 10k$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f_ix_i}{\Sigma f_i} = \frac{445 + 10k}{27 + k} = 15$$

$\Rightarrow 445 + 10k = 405 + 15k$

$\Rightarrow 5k = 40 \Rightarrow k = 8$

13. (a)

No. of Workers (f)	Class Int.	x	fx_i
7	0–10	5	35
10	10–20	15	150
15	20–30	25	375
8	30–40	35	280
10	40–50	45	450
$\Sigma f = 50$			$\Sigma fx_i = 1290$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f_ix_i}{\Sigma f_i} = \frac{1290}{50} = 25.8$$

Alternate Method:

Let, Mean = 25

Deviation = – 20, – 10, 0, + 10, + 20

$$D_{avg} = \frac{-140 - 100 + 0 + 80 + 200}{50}$$

$$= \frac{+40}{50} = +0.8$$

$\therefore$ Mean = 25 + 0.8 = 25.8

14. (d)

Class	Frequency	x	f × x
5 – 15	12	10	120
15 – 25	18	20	360
25 – 35	8	30	240
35 – 45	14	40	560
45 – 55	16	50	800
55 – 65	8	60	480

$\Sigma f = 76 \quad \Sigma f \times x = 2560$

$$\text{Mean} = \frac{\Sigma f \times x}{\Sigma f} = \frac{2560}{76} = 33.68$$

15. (c)

Class	f	$x = \frac{b-a}{2}$	fx
0-10	8	5	40
10-20	10	15	150
20-30	k	25	25k
30-40	6	35	210
40-50	12	45	540
	k + 36		$\Sigma fx = 25k + 940$

$$\text{Mean } \bar{x} = \frac{\Sigma f_ix_i}{\Sigma f_i} = \frac{940 + 25k}{36 + k} = 26$$

$\Rightarrow 940 + 25k = 936 + 26k \Rightarrow k = 4$

Alternate Method:

$\therefore$ Mean = 26

Deviation = – 21, –11, – 1, +9, + 19

$\Rightarrow -168, -110 - k + 54 + 228 = 0$

$\Rightarrow -278 - k + 282 = 0 \Rightarrow k = 4$

16. (c)

Class Interval (x)	Mid-value (x_i)	Frequency (f_i)	x_if_i
0-10	5	8	40
10-20	15	12	180
20-30	25	10	250
30-40	35	P	35P
40-50	45	9	405
Total		$\Sigma f_i = 39 + P$	$\Sigma x_if_i = 875 + 35P$

$$\text{Mean} = \frac{\sum x_if_i}{\sum f_i}$$

$$\Rightarrow 25.2 = \frac{875 + 35P}{39 + P}$$

$\Rightarrow 982.8 + 25.2P = 875 + 35P$

$\Rightarrow 982.8 - 875 = 35P - 25.2P$

$\Rightarrow 107.8 = 9.8P$

$$\Rightarrow P = \frac{107.8}{9.8} \Rightarrow P = 11$$

$\therefore$ The value of P is 11

17. (b)

Class	f	$x = \frac{b+a}{2}$	$(x + A)$	$(fx + A)$
50-150	16	100	–200	–3200
150-250	10	200	–100	–1000
250-350	22	300	0	0
350-450	15	400	100	1500
450-550	12	500	200	2400
	N = 75			$\Sigma fx = -300$

Let A = 300

$$\text{Mean } (\bar{x}) = 300 + \frac{1}{75} \times (-300)$$

$\bar{x} = 300 - 4 = 296$

18. (d) We know, Empirical
Mode = 3 × Median − 2 × Mean
19.5 = 3 × 85 − 2 × Mean

$$\text{Mean} = \frac{255 - 19.5}{2} = 117.75 \approx 117.8$$

19. (b) We know, Empirical
Mode = 3 × Median − 2 × Mean
26.7 = 3 × 71 − 2 × Mean

$$\text{Mean} = \frac{213 - 26.7}{2} = \frac{186.3}{2} \approx 93.2$$

20. (c) Arrange the given data in ascending order
25, 27, 29, 30, 32, 33, 35
Here, n = 7 which is odd

$$\therefore \text{Median} = \frac{7+1}{2} = 4^{th} \text{ Observation} = 30$$

21. (a) Arrange data in ascending order
54, 55, 59, 60, 62, 65, 70
If data is odd then median

$$= \left(\frac{n+1}{2}\right)^{th} \text{ term} = \frac{8}{2} = 4^{th} \text{ term}$$

∴ Median = 60

22. (b) 34, 32, 48, 38, 24, 30, 27, 21, 35
Arrange in ascending order
21, 24, 27, 30, 32, 34, 35, 38, 48
Total number = 9 (odd)

$$\text{Median} = \frac{9+1}{2} = 5^{th} \text{ term}$$

Median = 32

23. (d) Ascending order
11, 12, 13, 13, 14, 15, 16, 17, 18, 19

$$\text{Median} = \frac{14+15}{2} = 14.5$$

24. (b) ATQ,
Arrange the number of wicket in ascending order = 0, 1, 2, 2, 3, 3, 3, 4, 5, 6
Mode = Most occurring = 3

25. (b) To find the median, we need to arrange the data in ascending order.
⇒ −1, 2, 2, 3, 6, 8, 9
Here number of observations (n) = 7 Which is odd.

$$\text{So, median} = \left(\frac{n+1}{2}\right)^{th} \text{ term}$$

$$= \left(\frac{7+1}{2}\right)^{th} \text{ term}$$

= 4th term
= 3
∴ The median of the given data is 3.

26. (a) Let the marks of those 5 candidates who failed in examination in ascending order as a_1, a_2, a_3, a_4, & a_5
Marks of candidates who passed in the examination = 9, 6, 7, 8, 8, 9, 6, 5, 4, & 7.
Arranging the given marks of all 15 candidates in ascending order, we have:-
a_1, a_2, a_3, a_4 and a_5, 4, 5, 6, 6, 7, 7, 8, 8, 9, 9.
Here n = 15 which is odd.

$$\text{So median} = \left(\frac{15+1}{2}\right)^{th} \text{ term}$$

= 8th term = 6
∴ The median of marks of all the 15 candidates who appeared in the examination is 6.

27. (d) 15, 16, 18, 22, $x+2$, $x+3$, 26, 27, 30

$$\text{Median} = \frac{9+1}{2} = 5^{th} \text{ term} = (x+2)$$

$\Rightarrow x + 2 = 24 \Rightarrow x = 22$

28. (d) ATQ,
The given data is arranged in ascending order. The number of observations in the given data is 10. So, Median will be half of the sum of 5th and 6th term.

$$\text{Hence, Median} = \frac{x + x + 2}{2}$$

$$\Rightarrow 63 = \frac{2x+2}{2}$$

$\Rightarrow 124 = 2x$
$\Rightarrow x = 63$
Hence, The value of x = 62

29. (b) $k - \frac{3}{2}$, k + 2, k − 1, k + 4, $k + \frac{1}{2}$, k − 3, $k + 4\frac{1}{2}$
Let, k = 0

$-\frac{3}{2}$, 2, − 1, 4, $\frac{1}{2}$, −3, $\frac{9}{2}$

Arrange in ascending order

−3, $-\frac{3}{2}$, − 1, $\frac{1}{2}$, 2, 4, $\frac{9}{2}$

Total no. = 7 (odd)

$$\text{Median} = \frac{7+1}{2} = 4^{th} \text{ term} = \frac{1}{2}$$

$$\text{Median} = k + \frac{1}{2}$$

30. (b) As median is the "middle" number of the sorted list of numbers and given that median of 19 observations observed to be 30
⇒ 30 is the middle most value amongst 19 observations. If two more observations (8 and 32) are added, where 8 is less than 30 and 32 is more than 30.

30 is still the middle most value as the two values are added an either side of 30.

⇒ So now after two more observations, total observations is 21
& Median of 21 observations is 30.

31. (a) We know that to find the median arrange data in ascending order
35, 41, 46, 48, 55, 56, 63, 76, 88, 90, 92
If number is odd then median.

$$= \left(\frac{n+1}{2}\right)^{th} \text{ term}$$

$$\text{median} = \frac{11+1}{2} = 6^{th} \text{ term}$$

$\boxed{\text{Median} = 56}$

when number 88 is replaced by 93 and 41 is replaced by 47
New data arrangement
35, 46, 47, 48, 55, 56, 63, 76, 90, 92, 93
New median = 56
Difference between new median and previous median = 56 − 56 = 0

32. (c) In the given Question,
Median is 6th no. in Ascending Order. It we add 3 in the five largest no. then Median Will Remain Same.

33. (d)
$$\text{Median} = \frac{5+6+7+9+10+12+14}{7}$$

$$= \frac{63}{7} = 9$$

Sum of standard deviation = (5−9)+(6−9)+(7−9)+(9−9)+(10−9)+(12−9)+(14−9)
= − 4 − 3 − 2 + 0 + 1 + 3 + 5 = 0

34. (c) ATQ
Mode = Mean + 16.2
Mode = 3 × Median − 2 × Mean
3 Mode = 3 × Median + 32.4
Mode = Median + 10.8

35. (d) ATQ,
Empirical formula: 3Median = 2 Mean + Mode
Mode − Median = 24.12
⇒ Mode = Median + 24.12
Then,
3 Median = 2 Mean + Median + 24.12
⇒ 2 Median − 2 Mean = 24.12
⇒ Median − Mean = 12.06

36. (b)

x	f	cf
1	8	8
2	10	18
3	11	29
4	16	45
5	20	65
6	25	90
7	15	105
8	9	114
9	6	120
	N = 120	

$$\text{Median} = \left(\frac{60^{th} + 61^{th}}{2}\right)^{term} = \frac{5+5}{2} = 5$$

37. (c) To find median we need to arrange the values of 'x' in ascending order.

x	f	c.f.(Cumulative Frequency)
4	6	6
5	4	6 + 4 = 10
6	5	10 + 5 = 15
7	4	15 + 4 = 19
8	6	19 + 6 = 25
9	9	25 + 9 = 34
10	8	34 + 8 = 42
Total	Σf = 42 = n	

Here, $\frac{n}{2} = \frac{42}{2} = 21$

The c.f. just more than $\frac{n}{2}$ is 25,

So, The median is 8.

38. (a)

Class Interval	Frequency	Cumulative frequency
0 – 5	3	3
5 – 10	5	8
10 – 15	4	12
15 – 20	2	14
20 – 25	7	21
25 – 30	6	27
30 – 35	5	32
	N = 32	

$\frac{N}{2} = 16$

Median Class = (20 – 25)

L = 20, CF = 14, F = 7, H = 5

$$\text{Median} = L + \frac{\left(\frac{N}{2} - CF\right)}{F} \times H$$

$$= 20 + \left(\frac{16-14}{7}\right) \times 5$$

$$= 20 + \frac{10}{7} = 21.43$$

39. (d)

Class	f	cf
0-10	8	8
10-20	3	11
20-30	7	18
30-40	4	22
40-50	10	32
50-60	1	33
60-70	3	36
70-80	5	41
80-90	2	43
90-100	4	47
	N = 47	

Median class = $\frac{47+1}{2}$ = 24th term

Median class = (40 – 50)

$$\text{Median} = 40 + \frac{\frac{47}{2} - 22}{10} \times 10$$

= 40 + 1.5 = 41.5

40. (d)

Class	f	cf
5-10	5	5
10-15	6	11
15-20	15	26
20-25	10	36
25-30	5	41
30-35	4	45
35-40	2	47
40-45	2	49
	N = 49	

Median class = $\left(\frac{49+1}{2}\right)^{th}$ = 25th term

Median class = 15 – 20

$$\text{Median} = L + \left(\frac{\frac{N}{2} - cf^-}{f}\right) \times h$$

$$= 15 + \frac{\frac{49}{2} - 11}{15} \times 5 = 19.5$$

41. (b)

Class	f	Cf
0-10	22	22
10-20	38	60
20-30	46	106
30-40	35	141
40-50	20	161
	N = 161	

Here, $\frac{N}{2} = \frac{161}{2} = 80.5$

Median class is 20 – 30.

$$\Rightarrow \text{Median} = l + \left(\frac{\frac{N}{2} - cf^-}{f}\right) h$$

$$= 20 + \left(\frac{80.5 - 60}{46}\right) \times 10 = 24.46$$

42. (c) For next 2 questions:

Class interval	x_i	f	fx_i	cf
2050-2550	2300	5	11,500	5
2550-3050	2800	10	28,000	15
3050-3550	3300	k	3300k	30
3050-3550	3800	8	30,400	38
4050-4550	4300	2	8600	40
4550-5050	4800	10	48000	50
		35 + k	126500 + 3300k	

ATQ,

$$\text{Avg} = \frac{\text{Sum of all observation}}{\text{Total number of all observation}}$$

$$\Rightarrow 3520 = \frac{126500 + 3300k}{35 + k}$$

$\Rightarrow 123200 + 3520k = 126500 + 3300k$

$\Rightarrow 220k = 3300$

$\Rightarrow k = 15$

43. (c) 6, 8, 5, 7, 12, 16, 6, 8, 13

Mean $(\bar{x}) = \frac{81}{9} = 9$

For median Arrange the data in Ascending Order.

5, 6, 6, 7, 8, 8, 12, 13, 16

Total no. = 9 (odd)

Median = $\frac{9+1}{2}$ = 5th term = 8

Hence, difference between mean and median = $\bar{x}$ – M = 9 – 8 = 1

44. (a) Mode = 7 (f = 5) Maximum

45. (b) Mode = Number which have maximum frequency then, Mode = 19

46. (d) Mode = 83 (f = 5) Maximum

47. (d) Mode = 27 (f = 3) Maximum

48. (c) Given,

Mean $(\bar{x})$ = 60, Median = 48

We know that,

Mode = 3 × Median – 2 × Mean

Mode = 3 × 48 – 2 × 60

Mode = 144 – 120 = 24

49. (d) Mean $(\bar{x})$

$$= \frac{9+35+20+25+25+15+25}{7}$$

$$= \frac{154}{7} = 22$$

Arrange in ascending order,

9, 15, 20, 25, 25, 25, 35

Median = 25

Mode = 25 [f = 3] Maximum

The sum of Mean, Median and Mode = 25 + 25 + 22 = 72

50. (c) Arrange in assending order = 16, 17, 18, 20, 21, 22, 24, 24, 24, 25, 25, 28

Median = $\frac{22+24}{2}$ = 23

Mean = $\frac{264}{12}$ = 22

Empirical formula,

Mode = 3 Medain – 2 Mean

= 3 × 23 – 2 × 22 = 69 – 44 = 25

51. (d) Mode = 2 (f = 3) Maximum

52. (c) ATQ,

6 = 2k + 1

⇒ 2k = 5 ⇒ k = 2.5

Hence, vlaue of K = 2.5

53. (c)

Category	f
0-10	6
10-20	10
20-30	20
30-40	5
40-50	2

Modal class = (20 – 30)

Maximum frequency = 20

$$\text{Mode} = L + \left(\frac{f - f_1}{2f - f_1 - f_2}\right) \times h$$

$$= 20 + \frac{20-10}{40-10-5} \times 10 = 24$$

54. (d)

Class	f
5-10	8
10-15	7
15-20	6
20-25	9
25-30	11
30-35	10

Modal class = (25 – 30)

$$\text{Mode} = L + \left(\frac{f - f_1}{2f - f_1 - f_2}\right) \times h$$

$$= 25 + \frac{11-9}{22-9-10} \times 5 = 28.33$$

55. (b)

Attendence	f
6-10	7
10-14	13
14-18	18
18-22	8
22-26	2

Modal class = (14 – 18)

Maximum frequency = 18

$$\text{Mode} = L + \left(\frac{f - f_1}{2f - f_1 - f_2}\right) \times h$$

$$= 14 + \frac{18-13}{36-13-8} \times 4 = 15.33$$

56. (b) Class of maximum frequency (23) = 12 – 15

$f_1 = 23, f_0 = 10$ & $f_2 = 21$

$l = 12$ & $i = 3$

$$\text{Mode} = 12 + \left(\frac{13}{46-10-21}\right) \times 3$$

$$= 12 + \frac{13 \times 3}{15} = 14.6$$

57. (a)

x	f	fx
9	1	9
12	6	72
5	9	45
8	7	56
7	4	28
6	3	18
	N = 30	$\Sigma fx = 228$

$$\text{Mean } (\overline{x}) = \frac{228}{30} = 7.6$$

Mode = 5 [f = 9 Maximum]

Diff. between Mean and Mode

= 7.6 – 5 = 2.6

58. (d) Given,

35, 40, 25, 27, 38, 45, 50, 65

Range = Higher limit – Lower limit

Range = 65 – 25 = 40

59. (d) Given,

12, 22, 7, 1, 5, 27, 30, 43

Range = Higher limit – Lower limit

Range = 43 – 1 = 42

60. (a) Here we have, $M_0 = 48.5$

$l = 46.5, f_1 = 34, f_0 = 32, f_2 = 25$

Now,

$$48.5 = 46.5 + \frac{34-32}{2 \times 34 - 32 - 25} \times i$$

$$\therefore i = \frac{2 \times 11}{2} = 11$$

61. (b) Range = Higher limit – Lower limit

Range = 80 – 10 = 70

62. (c)

Class Interval	Mid-point (xi)	Frequency (fi)	xifi
10-20	15	20	300
20-30	25	15	375
30-40	35	10	350
40-50	45	$x = 29$	1305
50-60	55	$y = 26$	1430
Total		$\sum fi = 100$	$\sum xifi = 3760$

$$\text{Mean} = \frac{\sum xifi}{\sum fi} = \frac{3760}{100} = 37.6$$

∴ The mean of series-I is 37.6

63. (c)

Class Interval	Series-II
10 – 20	4
20 – 30	8
30 – 40	$4 = f_0$
40 – 50	$2x = 58$ = Model class f_1
50 – 60	$y = 26 = f_2$

$$\text{Mode} = L + \frac{f_1 - f_0}{(f_1 - f_0)(f_1 - f_2)} \times h$$

$$\text{Mode} = 40 + \frac{58-4}{(58-4)+(58-26)} \times 10$$

$$\Rightarrow 40 + \left(\frac{54}{54+32}\right) \times 10$$

$$\Rightarrow 40 + \left(\frac{54}{86} \times 10\right)$$

$\Rightarrow 40 + 6.28 \Rightarrow 46.28$

$\Rightarrow$ 46 (approx)

64. (b) Given data, 3, 6, 5, 2, 4

$$\text{Mean } (\overline{x}) = \frac{20}{5} = 4$$

x_i	$(x_i - \overline{x})$	$\Sigma(x_i - \overline{x})^2$
3	–1	1
6	2	4
5	1	1
2	–2	4
4	0	0
		10

$$\text{Variance} = \frac{\Sigma(x_i - \overline{x})^2}{n} = \frac{10}{5} = 2$$

65. (c) Given data, 2, 5, 6, 8, 9

x_i	$(x_i - \overline{x})$	$\Sigma(x_i - \overline{x})^2$
2	–4	16
5	–1	1
6	0	0
8	2	4
9	3	9
30		30

$$\text{Mean } (\overline{x}) = \frac{30}{5} = 6$$

$$\text{Variance} = \frac{30}{5} = 6$$

66. (d)

x_i	$(x_i - \overline{x})$	$\Sigma(x_i - \overline{x})^2$
6	–4	16
7	–3	9
10	0	0
12	2	4
13	3	9
8	–2	4
14	4	16
70		70

$$\text{Mean } (\overline{x}) = \frac{70}{7} = 10$$

$$\text{Variance} = \frac{\Sigma(x_i - \overline{x})^2}{n} = \frac{58}{7} = 8.29$$

67. (c) If each observations is doubled than resulting variance will be 2^2 times.

Now, Variance = $2^2 \times 5$

68. (c) $\sigma^2 = 6$

New variance = $3^2 \times 6 = 54$

69. (b) $\overline{x}_{(old)} = 10$

$$= \frac{\sum x_i(\text{old})}{10} = 10 \Rightarrow \sum x_i(\text{old}) = 100$$

$$\sum x_{i(new)} = 100 - 8 + 18 = 110$$

$$\overline{x}_{(new)} = \frac{110}{10} = 11$$

$$\text{Var}_{(old)} = 4 = \frac{\sum {x_{i(old)}}^2}{10} - \left(\overline{x}_{(old)}\right)^2$$

$$\sum x^2_{i(old)} = 1040$$

$$\sum x^2_{i(new)} = 1040 - 64 + 324 = 1300$$

$$\text{Var}_{(new)} = \frac{1300}{10} - (11)^2 = 130 - 121 = 9$$

70. (d) If we increase in values then SD or variance remains same.

Standard Deviation = $\sqrt{\text{Varience}}$

Variance = $SD^2 = 3^2 = 9$

71. (b) Standard Deviation

$= \sqrt{\text{Varience}} = \sqrt{0.81}$

Standard Deviation = 0.9

72. (c) Given data, 3, 4, 5, 6, 7

$$\text{Mean } (\overline{x}) = \frac{25}{5} = 5$$

x_i	$(x_i - \overline{x})$	$\Sigma(x_i - \overline{x})^2$
3	–2	4
4	–1	1
5	0	0
6	1	1
7	2	4
		10

$$\text{Variance} = \frac{\Sigma(x_i - \overline{x})^2}{n} = \frac{10}{2} = 2$$

Standard Deviation = $\sqrt{2}$

73. (a) Given data, 5, 3, 4, 7

$$\text{Mean } (\overline{x}) = \frac{19}{4} = 4.75$$

x_i	$(x_i - \overline{x})$	$\Sigma(x_i - \overline{x})^2$
5	0.25	0.0625
3	–1.75	3.0625
4	–0.75	0.5625
7	2.25	5.0625
		8.75

$$\text{Variance} = \frac{\Sigma(x_i - \overline{x})^2}{n} = \frac{8.75}{4} = 2.1875$$

Standard Deviation = $\sqrt{2.1875}$

= 1.479 ~ 1.49

74. (d) Given data, 4, 7, 9, 10, 15

$$\text{Mean } (\overline{x}) = \frac{45}{5} = 9$$

x_i	$(x_i - \overline{x})$	$\Sigma(x_i - \overline{x})^2$
4	–5	25
7	–2	4
9	0	0
10	1	1
15	6	36
		66

$$\text{Variance} = \frac{\Sigma(x_i - \overline{x})^2}{n} = \frac{66}{5} = 13.2$$

Standard Deviation = $\sqrt{13.2}$ = 3.633

75. (a) Given data, 3, 8, 7, 6, 5, 1

$$\text{Mean } (\overline{x}) = \frac{30}{6} = 5$$

x_i	$\Sigma\lvert x_i - \bar{x}\rvert$
3	2
8	3
7	2
6	1
5	0
1	4
	Total = 12

Mean deviation = $\frac{\Sigma|x_i-\bar{x}|^2}{n} = \frac{12}{6} = 2$

Coffi. of M.D. = $\frac{MD}{\bar{x}} = \frac{2}{5} = 0.4$

76. (c) Median = 14

M.D. = $\frac{11+7+2+0+1+4+8}{7} = \frac{33}{7}$

Coefficient = $\frac{MD}{Median} = \frac{\frac{33}{7}}{14} = \frac{33}{98}$

= 0.336

77. (c) Given data, 5, 3, 7, 8, 4, 9

Mean ($\bar{x}$) = $\frac{36}{6}$ = 6

x_i	$\Sigma\lvert x_i - \bar{x}\rvert$
5	1
3	3
7	1
8	2
4	2
9	3
	12

Mean deviation = $\frac{\Sigma(x_i-\bar{x})^2}{n} = \frac{12}{6} = 2$

78. (b) Let us make the table of the given data and append other columns after calculations

x_i	f_i	$x_i f_i$	$\lvert x_i - \bar{x}\rvert$	$f_i\lvert x_i - \bar{x}\rvert$
10	4	40	40	160
30	24	720	20	480
50	28	1400	0	0
70	16	1120	20	320
90	8	720	40	320
	80	4000		1280

Let the assume mean = 50

The sum of calculated data N

= $\sum_{i=1}^{5} f_i = 80, \Rightarrow \sum_{i=1}^{5} f_i x_i = 4000$

Now, we have to find ($\bar{x}$) by using the formula

$\Rightarrow \bar{x} = \frac{1}{N}\sum_{i=1}^{5} f_i x_i = \frac{1}{80} \times 4000 = 50$

The absolute values of the deviations from the mean, i.e.,

$|x_i - \bar{x}|$, as shown in the table

From the table, $\sum_{i=1}^{5} f_i|x_i - \bar{x}| = 1280$

Therefore M.D. $(\bar{x})$

= $\frac{1}{N}\sum_{i=1}^{5}|x_i - \bar{x}| = \left(\frac{1}{80}\right) \times 1280 = 16$

So, the mean deviation about the mean for the given data is 16.

79. (b)

Class interval	f_i	x_i	cf	$d_i = \lvert x_i - \bar{m}_d\rvert$	$f_i d_i$
0 - 6	4	3	4	11	44
6 - 12	5	9	9	5	25
12 - 18	3	15	12	1	3
18 - 24	6	21	18	7	42
24 - 30	2	27	20	13	26
Total	N = 20				$\sum f_i d_i = 140$

$\because \frac{N}{2} = \frac{20}{2} = 10$

So, the median class is 12 – 18

Median = $l + \frac{\frac{N}{2} - Cf}{f} \times h$

$= 12 + \frac{10-9}{3} \times 6 = 12 + \frac{6}{3}(10-9) = 14$

$\therefore$ MD = $\frac{\sum f_i d_i}{\sum f_i} = \frac{140}{20} = 7$

80. (a) Given data, 52, 56, 66, 70, 75, 80, 82

Median (M) = 70

x_i	$\Sigma\lvert x_i - M\rvert$
52	18
56	14
66	4
70	0
75	5
80	10
82	12
	63

Mean deviation = $\frac{63}{7}$ = 9

81. (a) Given data,

4, 6, 9, 3, 10, 13, 2

Arrange in ascending order,

Median (M) = 2, 3, 4, $\boxed{6}$, 9, 10, 13

= 6

x_i	$\Sigma\lvert x_i - M\rvert$
4	2
6	0
9	3
3	3
10	4
13	7
2	4
	23

Mean deviation = $\frac{\Sigma|x_i - M|}{n}$

= $\frac{23}{7}$ = 3.28

82. (b) Given data,

7, 4, 10, 9, 15, 12, 7, 9, 7

Mode (M) = 7

x_i	$\Sigma\lvert x_i - M\rvert$
7	0
4	3
10	3
9	2
15	8
12	5
7	0
9	2
7	0
	23

Mean deviation = $\frac{23}{9}$ = 2.56

83. (a) Coffi. of variation

= $\frac{S.D.}{Mean} \times 100$

$\frac{5}{25} = \frac{1}{5}$ = 20%

84. (c) Coffi. of variation = $\frac{3}{6} \times 100$

= 50%

◆

28
Chapter

PERMUTATION & COMBINATION

CONCEPT OF FACTORIAL

The product of first n consecutive natural numbers is defined as factorial of n. It is denoted by n! or $\underline{|n}$.

$1! = 1$
$2! = 1 \times 2$
$3! = 1 \times 2 \times 3 = 6$
$4! = 1 \times 2 \times 3 \times 4 = 24$
$5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$
Therefore, $n! = 1 \times 2 \times 3 \times \ldots\ldots \times (n-1) \times n$

◆ Note that :
(i) $0! = 1$
(ii) The factorials of fractions and negative integers are not defined.

Ex. (i) $\frac{5!}{3!} \rightarrow \frac{5 \times 4 \times 3!}{3!} = 20$
(ii) $\frac{7!}{4!} \rightarrow \frac{7 \times 6 \times 5 \times 4!}{4!} = 210$

Ex. (i) $\frac{8!}{5!3!} \rightarrow \frac{8 \times 7 \times 6 \times 5!}{5! \times 3 \times 2 \times 1} = 56$
(ii) $\frac{10!}{6!4!} \rightarrow \frac{10 \times 9 \times 8 \times 7 \times 6!}{6! \times 4 \times 3 \times 2 \times 1} = 210$
(iii) $\frac{7!}{4!3!} \rightarrow \frac{7 \times 6 \times 5 \times 4!}{4! \times 3 \times 2 \times 1} = 35$

◆ **Principle of Addition :** If you have n disjoint events, i.e. $A_1, A_2, \ldots\ldots A_n$ with outcomes $n_1, n_2, \ldots\ldots n_n$ ways respectively, then any of the events can occur with $n_1 + n_2 + \ldots\ldots + n_n$ ways. Let's give one example for better understanding. Suppose there are 15 NITs and 20 IITs in India and you qualified for the JEE, so there are (15 + 20) = 35 ways you can select your college.

Another example, consider you go to a restaurant where you find 8 Chicken items and 5 veg items, now you want to order a dish among these. So, you can choose a dish in (8 + 5) = 13 ways.

◆ **Principle of Multiplication:** The multiplication rule asserts that if a task can be finished by the multiplication of the way the work is completed, then the task may be completed in a sequence of activities one after the other. Suppose A and B are events with n_1 & n_2 possible outcomes, respectively. Then the total number of outcomes for the sequence of the two events is $n_1 \times n_2$

Let us explain the principle of multiplication with an example: Suppose on Teacher's day you want to visit your kindergarten, High school, and your college. If there are three ways to connect your kindergarten and High school and five ways to connect your high school and college. Then you can go from your kindergarten to your college in 3 × 5 = 15 ways because you can choose any of the three routes for your high school and then again you can choose any of the five routes to your college. Selecting the entire route is dependent on both the routes you choose, hence multiplication.

Another example is, Suppose there are 20 IITs, each with 7 branches. Then the topper can select his branch in 20 × 7 = 140 ways.

1. If the digits are not allowed to repeat in any number formed by using the digits 0, 2, 4, 6, 8 then the number of all numbers greater than 10,000 is equal to–
(a) 90 (b) 94
(c) 95 (d) 96

PERMUTATION OF FORMULAE

➢ The number of permutations (arrangements) of 'n' different things out of which 'r' things are taken at a time and where the repetition is not allowed is:

$${}^nP_r = \frac{n!}{(n-r)!}$$

➢ Using the above formula, the total number of ways of arranging n different things (taking all at a time) is n!. Because in this case, r = n

$$\therefore {}^nP_n = \frac{n!}{(n-n)!} = \frac{n!}{0!} = \frac{n!}{1} = n!$$

Some Important Result on Permutation

➢ ${}^nP_n = \frac{n!}{(n-n)!} = \frac{n!}{0!} = \frac{n!}{1} = n!$

➢ ${}^nP_0 = \frac{n!}{(n-0)!} = \frac{n!}{n!} = 1$

➢ ${}^nP_1 = \frac{n!}{(n-1)!} = \frac{n(n-1)!}{(n-1)!} = n$

2. In how many ways can 5 man draw water from 5 taps if no tap can be used more than once?
(a) 120 (b) 125
(c) 121 (d) 122

3. In how many ways can the letters of the word QUANTS be arranged (Repetition is not allowed)?
(a) 725 (b) 722
(c) 720 (d) 723

4. How many words with or without meaning, can be formed by using all the letters of the word, 'DELHI' using each letter exactly once?
(a) 125 (b) 122
(c) 124 (d) 120

5. In how many different ways can the letters of the word 'ADITYA' be arranged?
(a) 336 (b) 360
(c) 335 (d) 364

6. In how many different ways can the letters of the word 'BANKING' be arranged?
(a) 2520 (b) 2522
(c) 2521 (d) 2525

7. In how many different ways can the letters of the word 'RUMOUR' be arranged?
(a) 184 (b) 187
(c) 179 (d) 180

8. How many arrangements can be made out of the letters of the word 'ENGINEERING'?
(a) 27720 (b) 27725
(c) 27722 (d) 27719

9. How many words can be formed from the letters of the word TRIANGLE with T always at the beginning and E at the end.
(a) 722 (b) 725
(c) 720 (d) 723

10. In how many different ways can the letters of the word 'DESIGN' be arranged so that the vowels are at the two ends?
(a) 45 (b) 47
(c) 46 (d) 48

11. In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?
(a) 50400 (b) 50700
(c) 50500 (d) 50600

12. In how many different ways can the letters of the word 'DETAIL' be arranged such that the vowels must occupy only the odd positions?
(a) 35 (b) 36
(c) 34 (d) 33

13. Find the number of words that can be formed using letters 'L', 'M', 'N' and 'O' ?
(a) 64 (b) 65
(c) 63 (d) 62

14. How many four-digit numbers can be formed from the digits 1, 2, 3, 4, 5, 6 (Repetition of digits not allowed)?
(a) 360 (b) 364
(c) 365 (d) 362

15. How many 3 letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed?
(a) 722 (b) 724
(c) 721 (d) 720

16. How many words of three letters can be created using only consonants of the English alphabet?
(a) 7980 (b) 7984
(c) 7982 (d) 7985

PERMUTATIONS FORMULA WITH REPETITION

When 'r' things from 'n' things have to be arranged with repetitions then number of permutation = n^r. This is because each of the 'r' things can be selected in 'n' different ways, thus givining n × n × n × .... × n (r times) = n^r.

17. If there are 10 pairs of socks and you choose 2 pairs out of them, then

(i) Number of permutation, If repetition is not allowed
(a) 90 (b) 92
(c) 93 (d) 95

(ii) Number of permutation, If repetition is allowed
(a) 95 (b) 96
(c) 100 (d) 102

18. How many 3 letter words with or without meaning can be formed out of the letters of the word SWING when repetition of letters is not allowed?
(a) 60 (b) 65
(c) 64 (d) 63

19. How many 3 letter words with or without meaning can be formed out of the letters of the word SMOKE when repetition of words is allowed?
(a) 122 (b) 125
(c) 124 (d) 126

20. In how many different ways can the letters of the word 'RECTITUDE' be arranged so that the vowels come together?
(a) 4320 (b) 4321
(c) 4324 (d) 4322

21. In how many ways can 7 beads can be arranged to form a necklace?
(a) 365 (b) 362
(c) 364 (d) 360

22. A company has 10 software engineers and 6 civil engineers. In how many ways can they be seated around a round table so that two of the civil engineers will not sit together?
(a) $9!\times\frac{10!}{4!}$ (b) $9!\times\frac{12!}{3!}$
(c) $9!\times\frac{13!}{5!}$ (d) $9!\times\frac{15!}{4!}$

23. There are 20 stations between Hyderabad and Bangalore. How many second class tickets have to be printed, so that a passenger can travel from any station to other station?
(a) 380 (b) 385
(c) 384 (d) 386

24. There are five stations on a railways line. What is the number of different journey tickets that are required for railway authorities?
(a) 22 (b) 25
(c) 24 (d) 20

25. In how many can 4 boys and 5 girls be seated in a row so that they are alternate?
(a) 2885 (b) 2884
(c) 2886 (d) 2880

26. In how many ways can 10 books be arranged on a shelf such that a particular pair of books should always be together?
(a) 9! × 2! (b) 9! × 5!
(c) 9! × 3! (d) 9! × 4!

27. 4 boys and 2 girls are to be seated in a row in such a way that the two girls are always together. In how many different ways can they be seated?
(a) 240 (b) 244
(c) 245 (d) 246

COMBINATION FORMULAE

Combinations are selections made by taking some or all of a number of objects, irrespective of their arrangements. The number of combinations of n different things taken r at a time, denoted by ^nC_r

and it is given by, $^nC_r = \frac{n!}{r!(n-r)!}$,

where $0 \le r \le n$.

Note: "To write the direct value N^r from ^nC_r formulae, by multiplying n r-times in decreasing order and write D^r by multiplying r in decreasing order till 1.

For Example, $^5C_2 = \frac{5\times4}{2\times1} = 10$

Another example, $^6C_4$

$= \frac{6\times5\times4\times3}{4\times3\times2\times1} = 15$

Some Important Result on Combinations

- The number of ways of selecting n objects out of n objects is:
$$^nC_n = \frac{n!}{n!(n-n)!} = \frac{n!}{n!0!} = 1$$

- The number of ways of selecting 0 objects out of n objects is:
$$^nC_0 = \frac{n!}{0!(n-0)!} = \frac{n!}{0!n!} = 1$$

- The number of ways of selecting 1 object out of n objects is:
$$^nC_1 = \frac{n!}{1!(n-1)!} = \frac{n\times(n-1)!}{(n-1)!} = n$$

- The number of Combinations of 'n' different things taking some or all at a time
(i) $^nC_1 + {^nC_2} + {^nC_3} + \ldots\ldots + {^nC_n} = 2^n - 1$
(ii) $^nC_0 + {^nC_2} + {^nC_4} + \ldots\ldots = {^nC_1} + {^nC_3} + {^nC_5} + \ldots\ldots = 2^{n-1}$
(iii) $(^nC_0)^2 + (^nC_1)^2 + (^nC_2)^2 + \ldots\ldots + (^nC_n)^2 = {^{2n}C_n}$

28. Amit has 5 blue, 4 red and 3 green socks in his cupboard. Out of this he has to choose 4 socks. In how many ways can he do this?
(a) 490 (b) 495
(c) 496 (d) 494

29. A school team has eight volleyball players. A five member team will be selected out of these eight players. How many different selections can be made?
(a) 52 (b) 55
(c) 54 (d) 56

30. A group has 3 lawn tennis players S, T, U. A team consisting of 2 players is to be formed. In how many ways can we do so?
(a) 4 (b) 3
(c) 2 (d) 6

31. In how many ways can a group of 5 men and 2 women be made out of total of 7 men and 3 women?
(a) 65 (b) 66
(c) 63 (d) 64

32. A question paper has two parts P and Q, each containing 10 questions. If a student needs to choose 8 from part P and 4 from part Q, in how many ways can he do that?
(a) 9455 (b) 9453
(c) 9450 (d) 9454

33. In an examination, a minimum of marks is to be scored in each 6 subjects to pass. In how many ways can a students fail.?
(a) 63 (b) 64
(c) 62 (d) 65

34. A team of 3 members need to be formed out of 5 men and 2 women. In how many ways team can be formed so as to include at least 1 woman?
(a) 25 (b) 23
(c) 26 (d) 24

35. Four couples (husband and wife) decide to form a committee of four members. Find the number of different committees that can be formed in which no couple finds a place
(a) 15 (b) 14
(c) 13 (d) 16

36. An urn contains 5 red marbles, 4 black marbles and 3 white marbles. Then the number of ways in which 4 marbles can be drawn so that at the most three of them are red is ________.
(a) 492 (b) 491
(c) 494 (d) 490

37. How many triangles can be formed by joining the vertices of an octagon?
(a) 57
(b) 59
(c) 56
(d) 58

38. Find the number of triangles that can be formed using 14 points in a plane such that 4 points are collinear?
(a) 365 (b) 368
(c) 360 (d) 371

39. There are 8 points in a plane out of which 3 are collinear. How many straight lines can be formed by joining them?
(a) 25 (b) 28
(c) 30 (d) 26

40. There is a polygon of 11 sides. How many triangles can be drawn by only using the vertices of the polygon?
(a) 165
(b) 168
(c) 156
(d) 170

41. In a party every person shakes hand with every other person. If there was a total of 210 handshakes in the party, find the no. of persons who were present in the party.
(a) 25 (b) 21
(c) 34 (d) 28

ANSWER KEY

1.	(d)	2.	(a)	3.	(c)	4.	(d)	5.	(b)	6.	(a)	7.	(d)	8.	(a)	9.	(c)	10.	(d)
11.	(a)	12.	(b)	13.	(a)	14.	(a)	15.	(d)	16.	(a)	17.(i)	(a)	(ii)	(c)	18.	(a)	19.	(b)
20.	(a)	21.	(d)	22.	(a)	23.	(a)	24.	(d)	25.	(d)	26.	(a)	27.	(a)	28.	(b)	29.	(d)
30.	(b)	31.	(c)	32.	(c)	33.	(a)	34.	(a)	35.	(d)	36.	(d)	37.	(c)	38.	(c)	39.	(d)
40.	(a)	41.	(b)																

SOLUTIONS

1. (d) 0, 2, 4, 6, 8

2, 4, 6, 8				

4 4 3 2 1

Required no. of numbers = 4 × 4 × 3 × 2 = 96

2. (a) 1st man can draw water from any of the 5 taps.

2nd man can draw water from any of the remaining 4 taps.

3rd man can draw water from any of the remaining 3 taps.

4th man can draw water from any of the remaining 2 taps.

5th man can draw water from remaining 1 tap.

5	4	3	2	1

Hence total number of ways
$= 5 \times 4 \times 3 \times 2 \times 1 = 120$

3. (c) Number of ways = n! = 6! = 720

4. (d) The word 'DELHI' has 5 letters and all these letters are different.
Total number of words (with or without meaning) that can be formed using all these 5 letters using each letter exactly once = Number of arrangements of 5 letters taken all at a time
$^5P_5 = 5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

5. (b) The word 'ADITYA' has 6 letters. In these 6 letters, 'A' occurs 2 times,
Total Number of ways $= \frac{6!}{2!} = 360$

6. (a) The word 'BANKING' has 7 letters. In these 7 letters, 'N' occurs 2 times,
Total Number of ways $= \frac{7!}{2!} = 2520$

7. (d) The word 'RUMOUR' has 6 letters. In these 6 letters, 'R' occurs 2 times, 'U' occurs 2 times and rest of the letters are different.
Hence, number of ways to arrange these letters
$= \frac{6!}{(2!)(2!)} = 180$

8. (a) The word 'ENGINEERING' has 11 letters.
But in these 11 letters, 'E' occurs 3 times, 'N' occurs 3 times, 'G' occurs 2 times, 'I' occurs 2 times and rest of the letters are different.
Hence, number of ways to arrange these letters
$= \frac{11!}{(3!)(3!)(2!)(2!)} = 27720$

9. (c) If we fix up 'T' in the beginning and 'E' at the end, then the remaining 6 letters can be arranged in $^6P_6$ that is 6! which is 720 ways.

10. (d) Number of ways = 4! × 2! = 48

11. (a) The word 'CORPORATION' has 11 letters. It has the vowels 'O', 'O', 'A', 'I', 'O' in it and these 5 vowels should always come together.
Hence these 5 vowels can be grouped and considered as a single CRPRTN(OOAIO).
Hence we can assume total letters as 7. But in these 7 letters, 'R' occurs 2 times and rest of the letters are different.
Number of ways to arrange these letters
$= \frac{7!}{2!} = \frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1} = 2520$
In the 5 vowels (OOAIO), 'O' occurs 3 and rest of the vowels are different.
Number of ways to arrange these vowels among themselves
$= \frac{5!}{3!} = \frac{5 \times 4 \times 3 \times 2 \times 1}{3 \times 2 \times 1} = 20$
Hence, required number of ways
$= 2520 \times 20 = 50400$

12. (b) The word 'DETAIL' has 6 letters which has 3 vowels ('E', 'A', 'I') and 3 consonants ('D', 'T', 'L')
The 3 vowels ('E', 'A', 'I') must occupy only the odd positions.
Let's mark the positions as (1) (2) (3) (4) (5) (6). Now, the 3 vowels should only occupy the 3 positions marked as (1), (3) and (5) in any order.
Hence, number of ways to arrange these vowels
$= {}^3P_3 = 3! = 3 \times 2 \times 1 = 6$
Total number of ways
Now we have 3 consonants ('D', 'T', 'L') which can be arranged in the remaining 3 positions in any order.
Hence, number of ways to arrange these consonants $= {}^3P_3 = 3!$
$= 3 \times 2 \times 1 = 6$
∴ Required no. of ways = Number of ways to arrange the vowels × Number of ways to arrange the consonants = 6 × 6 = 36

13. (a) Total letters = 4
1 letter word = 1 × 4 = 4
2 letter word = 4 × 3 = 12
3 letter word = 4 × 3 × 2 = 24
4 letter word = 4 × 3 × 2 × 1 = 24
Total number of word = 4 + 12 + 24 + 24 = 64

14. (a) Here, n = 6, r = 4
$^6P_4 = \frac{6!}{(6-4)!} = 360$
Thus, Total 360 numbers can be formed.

15. (d) The word 'LOGARITHMS' has 10 different letters.
Hence, the number of 3 letter - words (with or without formed by using these letters meaning)
$= {}^{10}P_3 = 10 \times 9 \times 8 = 720$

16. (a) Number of ways $= {}^{21}P_3$
$= \frac{21!}{(21-3)!}$
$= \frac{21 \times 20 \times 19 \times 18!}{18!} = 7980$

17. (i)(a)

$${}^{10}P_2 = \frac{10!}{(10-2)!} = \frac{10!}{8!} = \frac{10 \times 9 \times 8!}{8!}$$

= 90 ways

(ii)(c) If we have repetitions, we always have n arrangements every time. We have 10^2 ways = 100 ways.

18. (a) Number of ways

$$= {}^5P_3 = \frac{5!}{(5-3)!} = 60$$

19. (b) Number of ways = $n^r = 5^3 = 125$

20. (a)Use the following result to solve such type of questions–

Number of ways that the letters of the given word be arranged so that vowels come together = (No. of vowels)! × (No. of consonants + 1)!

$$\text{Number of ways} = \left(\frac{4! \times 6!}{2! \times 2!}\right) = 4320$$

Note: Number of ways that the letters of the given word be arranged so that consonants come together = (No. of consonants)! × (No. of vowels + 1)!

- ➢ The number of circular permutation of n different things taken all at a time is $\frac{{}^nP_n}{n} = (n-1)!$, if clockwise and anticlockwise orders are taken as different.
- ➢ The number of circular permutations of 'n' different things taken. All at a time is $\frac{1}{2}(n-1)!$, if clockwise and anticlockwise order are taken to be same.

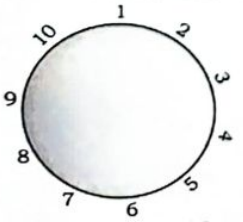
21. (d) Number of arrangements possible

$$= \frac{1}{2}(7-1)! = \frac{1}{2} \times 6!$$

$$= \frac{1}{2} \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 360$$

22. (a)10 software engineers can be arranged around a round table in (10 – 1)! = 9! ways...(i)

Now we need to arrange civil engineers such that no two civil engineers can be seated together. i.e., we can arrange 6 civil engineers in any of the 10 positions marked as × below.



(were 1, 2, 3, ... 10 represent software engineers)

This can be done in ${}^{10}P_6$ ways ...(ii)

From (i) and (ii),

Required number of ways = 9! × ${}^{10}P_6$

$$= 9! \times \frac{10!}{4!}$$

23. (a) The total number of stations = 20

From 20 stations we have to choose any two stations and the direction of travel (i.e., Hyderabad to Bangalore is different from Bangalore to Hyderabad) in ${}^{20}P_2$ ways.

${}^{20}P_2 = 20 \times 19 = 380$

24. (d) The total number of stations = 5

From 5 stations we have to choose any two stations and the direction of travel (i.e., A to B is different from B to A) in ${}^5P_2$ ways.

${}^5P_2 = 5 \times 4 = 20$

25. (d) **G B G B G B G B G**

The diagram shows the possible arrangement of sitting of boys and girls.

Now, 4 boys can be seated in 4 places in ${}^4P_4 = 4!$

and 5 girls in 5 places in 5! ways.

∴ Required no. of ways = 4! × 5!

= 24 × 120 = 2880

26. (a) We have a total of 10 books.

Given that a particular pair of books should always be together.

Hence, just tie these two books together and consider as a single book.

Hence we can take total number of books as 9.

These 9 books can be arranged in ${}^9P_9 = 9!$ ways.

We had tied two books together.

These books can be arranged among themselves in ${}^2P_2 = 2!$ ways.

Hence, required number of ways

= 9! × 2!

27. (a) Assume the 2 given students to be together (i.e. one). Now there are five students.

Possible ways of arranging them are = 5! = 120

Now, they (two girls) can arrange themselves in 2! ways.

Hence total ways = 120 × 2 = 240

- ➢ Number of ways to declare the result where 'n' match are played = 2^n

28. (b) Number of ways = ${}^{12}C_4$

$$= \frac{12!}{4!(12-4)!} = \frac{12 \times 11 \times 10 \times 9}{4 \times 3 \times 2 \times 1} = 495$$

29. (d) Number of ways = ${}^8C_5$

$$= \frac{8 \times 7 \times 6 \times 5!}{5! \times 3 \times 2 \times 1} = 56$$

30. (b) Number of ways = ${}^3C_2 = \frac{3 \times 2!}{2! \times 1} = 3$

31. (c) Number of ways = ${}^7C_5 \times {}^3C_2$

$$= \frac{7 \times 6 \times 5!}{5! \times 2 \times 1} \times \frac{3 \times 2!}{2! \times 1} = 63$$

32. (c) Number of ways to choose 8 questions from part P

= ${}^{10}C_8$

Number of ways to choose 4 questions from part Q

= ${}^{10}C_4$

Total number of ways

= ${}^{10}C_8 \times {}^{10}C_4$

= 45 × 210 = 9450

33. (a) The student will fail if he fails in one or more subjects out of 6 different subjects, i.e. ${}^6C_1 + {}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6$

$= ({}^6C_0 + {}^6C_1 + \ldots\ldots {}^6C_6) - {}^6C_0$

$= 2^6 - 1 = 64 - 1 = 63$ ways

Other Approach: He fails, if he fails in any of the 6 subjects. With each paper there two possibilities: either fail or pass. This way, for 6 subjects there are $2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$ = 64 possible cases. This also includes the case when he passes in all the 6 subjects. Thus, he can fail in 64 – 1 = 63 ways

34. (a) Team of 3 can be formed in 2 ways

(a) 2 men and 1 woman – ${}^5C_2 \times {}^2C_1$

(b) 1 man and 2 women – ${}^5C_1 \times {}^2C_2$

So total ways will be $({}^5C_2 \times {}^2C_1) + ({}^5C_1 \times {}^2C_2)$

= 25 ways.

35. (d) The number of committees of 4 gentlemen = ${}^4C_4$ = 1

The number of committees of 3 gentlemen, 1 wife = ${}^4C_3 \times {}^1C_1$

(∵ After selecting 3 gentlemen only 1 wife is left who can be included)

The number of committees of 2 gentlemen, 2 wives

= ${}^4C_2 \times {}^2C_2$

The number of committees of 1 gentleman, 3 wives

= ${}^4C_1 \times {}^3C_3$

The number of committees of 4 wives = 1

∴ The required number of committees

= 1 + 4 + 6 + 4 + 1 = 16

36. (d) 0 Red, 1 Red, 2 Red, 3 Red

Number of ways = ${}^7C_4 + {}^5C_1 \cdot {}^7C_3 + {}^5C_2 \cdot {}^7C_2 + {}^5C_3 \cdot {}^7C_1$ = 35 + 175 + 210 + 70 = 490

37. (c) Number of triangles that can be formed by joining the vertices of a polygon of n sides = ${}^nC_3$

Here n = 8

Hence, number of triangles that can be formed by joining the vertices of an octagon = ${}^8C_3$ = 56

38. (c) Suppose there are n points in a plane out of which m points are collinear.

Number of triangles that can be formed by joining these n points as vertices = ${}^nC_3 - {}^mC_3$

Here n = 14, m = 4

Hence, number of triangles

= ${}^nC_3 - {}^mC_3 = {}^{14}C_3 - {}^4C_3$ = 360

39. (d) Suppose there are n points in a plane out of which m points are collinear. Number of straight lines that can be formed by joining these n points

${}^nC_2 - {}^mC_2 + 1$

Here n = 8, m = 3

Required number of straight lines

= ${}^nC_2 - {}^mC_2 + 1$

= ${}^8C_2 - {}^3C_2 + 1$

= 28 – 3 + 1 = 26

40. (a) Number of sides in the polygon = 11

Number of vertices of the polygon = 11

$\therefore$ Number of triangles = ${}^{11}C_3$

$= \frac{11!}{3!(11-3!)} = \frac{11!}{3!8!} = \frac{11 \times 10 \times 9 \times 8!}{3 \times 2 \times 1 \times 8!}$

$= 11 \times 5 \times 3 = 165$

➢ Let there are 'n' persons in a hall. If every person shakes his hand with every other person only once, then total number of handshakes–

${}^nC_2 = \frac{n(n-1)}{2}$

41. (b) For each selection of two person there will be one handshake.

So, no. of handshakes in the party $= {}^nC_2$,

Where n = no. of persons.

Now, ${}^nC_2 = 210$ (given)

or, $\frac{n \times (n-1)}{2} = 210$

or, $n \times (n-1) = 2 \times (2 \times 3 \times 5 \times 7)$

$= 21 \times 20$

$\therefore n = 21$

Note: If in place of handshakes each person gives a gift to another person, then formula changes to

$= n(n-1)$

➢ The number of ways of dividing 'm + n' things into two groups containing 'm' and 'n' things respectively

$= {}^{m+n}C_m \times {}^nC_n = \frac{(m-n)!}{m!n!}$

➢ The number of ways of dividing 'm + n + p' things into three groups containing 'm', 'n' and 'p' things respectively

$= {}^{m+n+p}C_m . {}^{n+p}C_p = \frac{(m+n+p)!}{m!n!p!}$

➢ If there are n non-collinear points in a plane, then

(i) Number of straight lines formed $= {}^nC_2$

(ii) Number of triangles formed $= {}^nC_3$

(iii) Number of quadrilaterals formed $= {}^nC_4$

➢ If there are n points in a plane out of which m are collinear, then

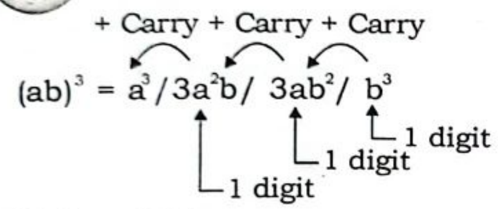
(i) Number of straight lines formed $= {}^nC_2 - {}^mC_2 + 1$

(ii) Number of triangles formed $= {}^nC_3 - {}^nC_3$

➢ Number of diagonals in a polygon of n sides $= {}^nC_2 - n$

SPEED BOOSTER HACKS

◆ Cube of two Digits Number ◆



- **Cube of 14**

Here, a = 1 & b = 4

$14^3 = 1^3/3.1^2.4/3.1.4^2/4^3 = 1/12/48/64 = 2744$

- **Cube of 23**

Here, a = 2 & b = 3

$23^3 = 2^3/3.2^2.3/3.2.3^2/3^3 = 8/36/54/27 = 12167$

◆ Do it Yourself ◆

(i) 18^3 = ... (ii) 23^3 = ...

(iii) 29^3 = ... (iv) 33^3 = ...

(v) 38^3 = ... (vi) 43^3 = ...

(vii) 56^3 = ... (viii) 63^3 = ...

(ix) 69^3 = ... (x) 73^3 = ...

(xi) 77^3 = ... (xii) 82^3 = ...

(xiii) 87^3 = ... (xiv) 91^3 = ...

SPEED BOOSTER HACKS

◆ Cube Root of Non-perfect cube ◆

$$\sqrt[3]{N} = A \pm \frac{B}{3.A^2}$$

First find a number which is a perfect cube near to the number N, let it be A and the difference between N and A^3 is B.

Note: '+' sign is used if $N > A^3$ & '–' sign is used if $N < A^3$

Ex. $\sqrt[3]{60} = 4 - \frac{4}{3 \times 4^2} = \frac{188}{48} = 3.92$

Ex. $\sqrt[3]{72} = 4 + \frac{8}{3 \times 4^2} = \frac{200}{48} = 4.17$

◆ Do it Yourself ◆

(i) $\sqrt[3]{10}$ = ...

(ii) $\sqrt[3]{66}$ = ...

(iii) $\sqrt[3]{118}$ = ...

(iv) $\sqrt[3]{226}$ = ...

(v) $\sqrt[3]{525}$ = ...

(vi) $\sqrt[3]{1365}$ = ...

(vii) $\sqrt[3]{1500}$ = ...

29
Chapter

PROBABILITY

PROBABILITY

Probability is the measure of the likelihood of occurrence of an event. i.e. out of all the possibilities arising out of a certain random experiment, the chances of favourable outcome is measured in terms of probability. Hence, if in an experiment there are 'n' occurrences out of which 'm' occurrences are favourable to a particular event E, then the probability of the event E, denoted by P(E); is defined as $P(E) = \frac{m}{n}$.

Also, the non-occurrence of the event E, is denoted by $\bar{E}$, that is (n-m) in this case. So, (n-m) occurrences are not favourable to the event E, and favourable to the event $\bar{E}$.

$\therefore\ P(\bar{E}) = \frac{n-m}{n}$

We can observe that, $P(E) + P(\bar{E}) = 1$

Note: From the above discussion, we can infer that–

- $0 \le P(E) \le 1$ in all the cases.
- If P(E) = 1, the event is called a certain event.
- P(E) = 0, the event is called an impossible event.

TERMINOLOGIES INVOLVED

The list of the terms related to probability is as follows.

Experiment: An activity whose outcomes are not known is an experiment. Every experiment has a few favorable outcomes and a few unfavorable outcomes. The historic experiments of Thomas Alva Edison had more than a thousand unsuccessful attempts before he could make a successful attempt to invent the light bulb.

Random Experiment: A random experiment is an experiment for which the set of possible outcomes is known, but which particular outcome will occur on a particular execution of the experiment cannot be said prior to performing the experiment. Tossing a coin, rolling a die, and drawing a card from a deck are all examples of random experiments.

Event: A trial with a clearly defined outcome is an event. For example, getting a tail when tossing a coin is termed as an event.

Random Event: An event that cannot be easily predicted is a random event. For such events, the probability value is very less. The formation of a rainbow during the rain is a random event.

Outcome: This is the result of a trial. In the process of a sportsperson hitting a ball towards the goal post, there are two clear outcomes. He may either make the goal or miss the goal.

Possible Outcome: The list of all the outcomes in an experiment can be referred to as possible outcomes. In tossing a coin, the possible outcomes are head or tail.

Equally likely Outcomes: An experiment in which each of the outcomes has an equal probability, such outcomes are referred to as equally likely outcomes. In the process of rolling a six-faced dice, the probability of getting any number is equal.

P (any number) = $\frac{1}{6}$

Sample Space: It is the set of outcomes of all the trials in an experiment. On rolling a dice, the possible outcomes are 1, 2, 3, 4, 5 and 6. These outcomes make up the sample space. S = {1, 2, 3, 4, 5, 6}

Probable Event: An event that can be predicted is called a probable event. We can calculate the probability of such events. The probability of a particular child being promoted to the next class can be calculated, hence, we can refer to this as a probable event.

Impossible Event: An event that is not a part of the experiment, or which does not belong to the sample space of the outcomes of the experiment can be referred to as an impossible event. There is no snowfall in a temperate climatic region. Here, the snowfall can be referred to as an impossible event because the probability of occurrence of such an event is zero.

Complementary Events:

Complementary events occur when there are just two outcomes, and one event is exactly opposite to another event. For an event with probability P(A), its Complementary is $P(\bar{A})$.

$P(A) + P(\bar{A}) = 1$

In an examination, the event of success and the event of failure are complementary events.

P(Success) + P(Failure) = 1

◆ TYPE – I ◆
BASIC QUESTIONS

1. If the probability of winning a game is 0.3, what is the probability of losing it?

(a) 0.5 (b) 0.7
(c) 0.4 (d) 0.9

2. What is the probability of a prime number, if we select a number from first 20 natural numbers?

(a) $\frac{4}{7}$ (b) $\frac{2}{5}$
(c) $\frac{5}{2}$ (d) $\frac{4}{5}$

3. There are 3 white and 4 black balls in an urn. A ball is selected randomly. What is the probability to be white?

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$
(c) $\frac{5}{2}$ (d) $\frac{4}{5}$

4. A bag contains cards which are numbered from 2 to 90. A card is drawn at random from the bag. Find the probability that the card number is a perfect square.

(a) $\frac{7}{89}$ (b) $\frac{4}{87}$
(c) $\frac{7}{90}$ (d) $\frac{8}{89}$

5. There are 40 students in class X of a school of whom 25 are girls and 15 are boys. The class teacher has to select one student as a class representative. He writes the name of each student on a separate card, the cards being identical. Then she puts cards in a bag and stirs them thoroughly. She then draws one card from the bag. What is the probability that the name written on the card is the name of a boy?

(a) $\frac{2}{7}$ (b) $\frac{1}{4}$
(c) $\frac{1}{3}$ (d) $\frac{3}{8}$

6. A letter is chosen at random from the letters of the word 'ASSASSINATION". Find the probability that the letter chosen is a vowel ?

(a) $\frac{6}{13}$ (b) $\frac{9}{14}$
(c) $\frac{1}{2}$ (d) $\frac{7}{9}$

7. It is known that a box of 600 electric bulbs contains 12 defective bulbs. One bulb is taken out at random from this box. What is the probability that it is a non-defective bulb?

(a) 0.02 (b) 0.45
(c) 0.65 (d) 0.98

8. A bag contains 12 balls out of which x are white. If 6 more white balls are put in the bag, the probability of drawing a white ball will be double than that in first . Find x?

(a) 2 (b) 1
(c) 3 (d) 6

9. A jar contains 54 marbles each of which is blue, green or white. The probability of selecting a blue marble at random from the jar is $\frac{1}{3}$, and the probability of selecting a green marble at random is $\frac{4}{9}$. How many white marbles does the jar contain?

(a) 15 (b) 17
(c) 12 (d) 21

◆ TYPE – II ◆
QUESTIONS BASED ON COINS

- When n coins are tossed or single coin tossed n times:-
  Possible outcomes = 2^n
- When an unbiased coin is tossed once:
  Possible outcomes are
  $2^n = 2^1 = 2$
  Sample space → {H}, {T}
- When two unbiased coins are tossed simultaneously.
  Possible outcomes are
  $2^2 = 4$
  Sample space → {(H,H) (H,T) (TH) (TT)}
- When three unbiased coins are tossed simultaneously.
  Possible outcomes are
  $2^3 = 8$
  Sample Space → {(HHH) (HHT) (HTH) (THH) (HTT) (THT) (TTH) (TTT)}

10. Two unbiased coins are tossed up simultaneously. Find the probability of getting

(i) Two tails

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$
(c) $\frac{1}{3}$ (d) $\frac{1}{2}$

(ii) One head

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$
(c) $\frac{1}{4}$ (d) $\frac{1}{5}$

(iii) At least one tail

(a) $\frac{3}{4}$ (b) $\frac{1}{4}$
(c) $\frac{1}{5}$ (d) $\frac{1}{2}$

(iv) At most one tail

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{1}{5}$ (d) $\frac{3}{4}$

(v) No tail

(a) $\frac{1}{5}$ (b) $\frac{3}{4}$
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

11. If two coins are tossed simultaneously, what is the probaility that one coin will get head and the other coin will get tail?

(a) $\frac{5}{6}$ (b) $\frac{6}{7}$
(c) $\frac{1}{2}$ (d) $\frac{5}{4}$

12. Three unbiased coins are tossed up together. Find the probability of getting.

(i) All heads

(a) $\frac{5}{6}$ (b) $\frac{6}{7}$
(c) $\frac{1}{2}$ (d) $\frac{1}{8}$

(ii) At least one tail

(a) $\frac{7}{8}$ (b) $\frac{6}{7}$
(c) $\frac{1}{2}$ (d) $\frac{5}{4}$

(iii) Exactly 2 heads

(a) $\frac{5}{6}$ (b) $\frac{3}{8}$
(c) $\frac{1}{2}$ (d) $\frac{5}{4}$

13. Three coins are tossed, what is the probability that neither 3 heads nor 3 tails are obtained?

(a) $\frac{3}{7}$ (b) $\frac{3}{8}$
(c) $\frac{3}{4}$ (d) $\frac{3}{5}$

14. Four coins are tossed simultaneously, what is the probability that at least three coins get heads or tails?

(a) $\frac{3}{7}$ (b) $\frac{3}{8}$
(c) $\frac{4}{7}$ (d) $\frac{5}{8}$

15. A coin is tossed 5 times, what is a probability of getting exactly 2 heads?

(a) $\frac{5}{16}$ (b) $\frac{3}{8}$
(c) $\frac{4}{7}$ (d) $\frac{5}{8}$

16. A coin is tossed 8 times, what is a probability of getting exactly 6 tails?

(a) $\frac{5}{16}$ (b) $\frac{7}{64}$
(c) $\frac{4}{7}$ (d) $\frac{5}{8}$

17. A coin is tossed 9 times. Find the probability of atmost 2 tails.

(a) $\frac{21}{256}$ (b) $\frac{23}{256}$
(c) $\frac{29}{256}$ (d) $\frac{31}{256}$

18. A coin is tossed 7 times. Find the probability of atleast 2 tails.

(a) $\frac{15}{17}$ (b) $\frac{15}{16}$
(c) $\frac{15}{19}$ (d) $\frac{31}{32}$

◆ TYPE – III ◆
QUESTIONS BASED ON DICE

- When two dices are thrown simultaneously.
  Total number of possible cases
  = 6^2 = 36
  Sample space:

Second throw ↓ / First throw →	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

Note: Whenever you are asked about the probability of the sum of the numbers obtained after throwing two dice, remember to subtract 1 from the sum and divide it by the total number of cases (36) and if the value of the sum is more than 6, then subtract the sum from 13 and divide it by.

Sum	Cases	No. of cases	Probability
2	(1,1)	1	$\frac{1}{36}$
3	(1,2), (2,1)	2	$\frac{2}{36}$
4	(1,3), (2,3), (3,1)	3	$\frac{3}{36}$
5	(1,4), (2,3), (3,2), (4,1)	4	$\frac{4}{36}$
6	(1,5) (2,4), (3,3), (4,2), (5,1)	5	$\frac{5}{36}$
7	(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)	6	$\frac{6}{36}$
8	(2,6), (3,5), (4,4), (5,3), (6,2)	5	$\frac{5}{36}$
9	(3,6), (4,5), (5,4), (6,3)	4	$\frac{4}{36}$
10	(4,6), (5,5), (6,4)	3	$\frac{3}{36}$
11	(5,6), (6,5)	2	$\frac{2}{36}$
12	(6,6)	1	$\frac{1}{36}$
	Total →	36	

- When a dice is thrown once
  Sample space = {1, 2, 3, 4, 5, 6} = 6

19. A dice is thrown, find the probability of:

(i) A prime number

(a) $\frac{3}{7}$ (b) $\frac{1}{2}$
(c) $\frac{5}{2}$ (d) $\frac{4}{5}$

(ii) A multiple of 2 or 3 factor

(a) $\frac{2}{3}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{4}{5}$

(iii) A number greater than 4

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{1}{3}$ (d) $\frac{4}{5}$

20. A dice is thrown, find the probability of the following outcomes:

(i) Getting an even number

(a) $\frac{3}{7}$ (b) $\frac{1}{2}$

(c) $\frac{1}{3}$ (d) $\frac{4}{5}$

(ii) Getting an odd number

(a) $\frac{1}{2}$ (b) $\frac{3}{5}$

(c) $\frac{1}{3}$ (d) $\frac{4}{5}$

21. A dice is thrown twice, what is the probability of getting a sum of 7 when thrown twice?

(a) $\frac{1}{2}$ (b) $\frac{3}{5}$

(c) $\frac{1}{6}$ (d) $\frac{4}{5}$

22. Two Dice are thrown simultaneously. Find the probability of–

(i) Sum as 8

(a) $\frac{5}{36}$ (b) $\frac{5}{18}$

(c) $\frac{5}{27}$ (d) $\frac{5}{31}$

(ii) Atleast a sum of 9

(a) $\frac{5}{31}$ (b) $\frac{5}{27}$

(c) $\frac{5}{18}$ (d) $\frac{5}{36}$

(iii) A doublet i.e, same number on both the dice

(a) $\frac{5}{18}$ (b) $\frac{5}{36}$

(c) $\frac{5}{27}$ (d) $\frac{1}{6}$

(iv) A multiple of 2 on one dice and a multiple of 3 on the other dice

(a) $\frac{1}{2}$ (b) $\frac{11}{36}$

(c) $\frac{1}{6}$ (d) $\frac{4}{5}$

23. Two Dice are thrown Simultaneously. Find the probability that the number on the first dice is more than the number on the 2nd dice?

(a) $\frac{5}{18}$ (b) $\frac{5}{36}$

(c) $\frac{5}{12}$ (d) $\frac{1}{6}$

24. Two fair dice are thrown. Find the probability of getting a number whose sum is divisible by 2 or 4?

(a) $\frac{4}{5}$ (b) $\frac{1}{2}$

(c) $\frac{5}{18}$ (d) $\frac{1}{6}$

25. Two fair dice are thrown. Find the probability of getting a number whose sum is divisible by 2 and 4 ?

(a) $\frac{4}{5}$ (b) $\frac{1}{2}$

(c) $\frac{5}{18}$ (d) $\frac{1}{4}$

26. Two dice are thrown. Find the probability that sum of the numbers coming up on them is 9, if it is known that the number 5 always occurs on the first die.

(a) $\frac{1}{6}$ (b) $\frac{1}{8}$

(c) $\frac{4}{5}$ (d) $\frac{1}{3}$

27. A pair of fair dice are thrown. What is the probability that the sum of the numbers on both the dice is 5?

(a) $\frac{4}{36}$ (b) $\frac{1}{36}$

(c) $\frac{5}{36}$ (d) $\frac{6}{36}$

28. Two dice were thrown at the same time. What is the probability that the difference between the marks found between them is '1'.

(a) $\frac{5}{18}$ (b) $\frac{1}{6}$

(c) $\frac{5}{36}$ (d) $\frac{1}{4}$

29. An unbiased dice is thrown. What is the probability of getting an even number?

(a) $\frac{1}{2}$ (b) $\frac{2}{5}$

(c) $\frac{1}{3}$ (d) $\frac{2}{3}$

30. In a simultaneous throw of two dices, what is the probability of getting sum 14?

(a) 0 (b) 1

(c) 1 or 0 (d) NOT

31. In a single throw of two dice, find the probability that neither a doublet nor a total of 8 will appear.

(a) $\frac{7}{15}$ (b) $\frac{5}{18}$

(c) $\frac{13}{18}$ (d) $\frac{3}{16}$

32. A die is cast twice and a coin is tossed thrice. Find the probability that the dice will turn a 5 each time and the coin will turn a head every time.

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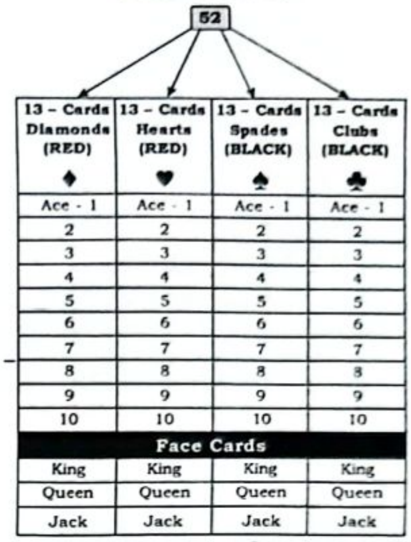
(a) $\frac{1}{100}$ (b) $\frac{1}{288}$

(c) $\frac{1}{200}$ (d) $\frac{1}{50}$

◆ TYPE – IV ◆
QUESTIONS BASED ON PLAYING CARDS

Playing Cards



13 – Cards Diamonds (RED) ♦	13 – Cards Hearts (RED) ♥	13 – Cards Spades (BLACK) ♠	13 – Cards Clubs (BLACK) ♣
Ace - 1	Ace - 1	Ace - 1	Ace - 1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Face Cards			
King	King	King	King
Queen	Queen	Queen	Queen
Jack	Jack	Jack	Jack

33. One card is drawn from a pack of 52 cards. What is the probability that the card drawn is–

(i) An ace

(a) $\frac{1}{13}$ (b) $\frac{3}{5}$

(c) $\frac{1}{26}$ (d) $\frac{5}{2}$

(ii) "10" of a Red suit

(a) $\frac{3}{7}$ (b) $\frac{5}{2}$

(c) $\frac{1}{26}$ (d) $\frac{3}{5}$

(iii) A face card

(a) $\frac{3}{7}$ (b) $\frac{3}{13}$

(c) $\frac{5}{2}$ (d) $\frac{1}{26}$

(iv) Either red or king

(a) $\frac{7}{13}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{1}{26}$

(v) Black and a queen

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{1}{26}$

34. One card is drawn from a pack of 52 cards. What is the probability that the card drawn is?

(i) A jack, queen or a king

(a) $\frac{3}{7}$ (b) $\frac{3}{13}$

(c) $\frac{5}{2}$ (d) $\frac{1}{26}$

(ii) Neither a heart nor a King

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{9}{13}$ (d) $\frac{1}{26}$

(iii) Other than Ace

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{12}{13}$

(iv) Red King

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{9}{13}$ (d) $\frac{1}{26}$

35. Jacks, Queens, Kings and Aces of red colour are removed. From the remaining cards a card is drawn at random. Find the probability, that the card drawn is a black queen?

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{9}{13}$ (d) $\frac{1}{22}$

36. A card is drawn at random from a deck of 52 cards. Then find the subsequent probability that this card is a king or a queen?

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{2}{13}$ (d) $\frac{1}{22}$

37. Three cards are drawn at random from 52 cards. Find the probability of these cards being a king, a queen and a jack.

(a) $\frac{16}{5214}$ (b) $\frac{16}{5624}$

(c) $\frac{16}{5220}$ (d) $\frac{16}{5525}$

38. Find the probability that when a hand of 3 cards are drawn from a well shuffled deck. What is the probability that it has:

(i) All faces cards

(a) $\frac{1101}{5242}$ (b) $\frac{1201}{5525}$

(c) $\frac{1301}{5425}$ (d) $\frac{11}{1105}$

(ii) Atleast one king

(a) $\frac{1301}{5425}$ (b) $\frac{1201}{5525}$

(c) $\frac{1101}{5422}$ (d) $\frac{1101}{5242}$

39. A person draws 3 cards from a pack of 52 cards. Find the probability of getting exactly two red cards?

(a) $\frac{13}{34}$ (b) $\frac{3}{5}$

(c) $\frac{9}{13}$ (d) $\frac{11}{34}$

40. A person draws 3 cards from a pack of 52 cards (with replacement). Find the probability of getting following outcomes:

(i) All three red cards

(a) $\frac{13}{34}$ (b) $\frac{1}{8}$

(c) $\frac{9}{13}$ (d) $\frac{11}{34}$

(ii) That none of the cards is an ace

(a) $\frac{1301}{5425}$ (b) $\frac{1201}{5525}$

(c) $\frac{1101}{5422}$ (d) $\frac{1728}{2197}$

41. Three cards are drawn one after another with replacement from a pack of cards. What is the probability of getting first card a Jack, second card a black card, and third card an even numbered card?

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(a) $\frac{5}{169}$ (b) $\frac{5}{338}$

(c) $\frac{25}{26}$ (d) $\frac{20}{338}$

42. Two cards are drawn from a pack of 52 cards. The probability that out of 2 cards, one card is red and one card is black is:

(a) $\frac{1}{2}$ (b) $\frac{13}{25}$

(c) $\frac{25}{51}$ (d) $\frac{26}{51}$

43. A bag contains cards numbered between 33 and 92. If one card is drawn from the bag, the probability that the number on the drawn card is a perfect square is:

(a) $\frac{5}{59}$ (b) $\frac{4}{59}$

(c) $\frac{1}{15}$ (d) $\frac{1}{12}$

44. Kings and Queens of black colour are taken out from a pack of 52 playing cards. A card is drawn from the remaining well-shuffled cards. Probability of getting a spade card is:

(a) $\frac{1}{4}$ (b) $\frac{11}{13}$

(c) $\frac{11}{48}$ (d) $\frac{11}{52}$

45. One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card?

(a) $\frac{1}{13}$ (b) $\frac{3}{13}$

(c) $\frac{9}{52}$ (d) $\frac{3}{52}$

46. One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. Find the probability that the card drawn is red and a king?

(a) $\frac{1}{22}$ (b) $\frac{1}{39}$

(c) $\frac{1}{26}$ (d) $\frac{2}{51}$

47. From a pack of 52 cards, two cards are drawn together at random. What is the probability of both the cards being kings?

(a) $\frac{1}{15}$ (b) $\frac{25}{57}$

(c) $\frac{35}{256}$ (d) $\frac{1}{221}$

48. Two cards are drawn from a pack of well shuffled cards. Find the probability that one is a club and other is King.

(a) $\frac{1}{52}$ (b) $\frac{1}{26}$

(c) $\frac{1}{13}$ (d) $\frac{1}{2}$

49. From a pack of 52 cards, one card is drawn at random. What is the probability that the card drawn is a ten or a spade?

(a) $\frac{4}{13}$ (b) $\frac{1}{4}$

(c) $\frac{1}{13}$ (d) $\frac{1}{26}$

50. One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. Find the probability that the card drawn is an ace?

(a) $\frac{1}{12}$ (b) $\frac{1}{13}$

(c) $\frac{2}{13}$ (d) $\frac{3}{28}$

51. One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. Find the probability that the card drawn is "10" of a black suit?

(a) $\frac{3}{28}$ (b) $\frac{5}{26}$

(c) $\frac{1}{26}$ (d) $\frac{1}{13}$

52. What is probability of drawing two clubs from a well shuffled pack of 52 cards?

(a) $\frac{13}{51}$ (b) $\frac{1}{17}$

(c) $\frac{1}{26}$ (d) $\frac{13}{17}$

• TYPE – V •
QUESTIONS BASED ON BALL / MARBLES

53. A glass jar contains 6 white, 8 black, 4 red and 3 blue marbles. If a single marble is chosen at random from the jar, what is the probability that it is black or blue?

(a) $\frac{13}{34}$ (b) $\frac{5}{338}$

(c) $\frac{11}{21}$ (d) $\frac{11}{34}$

54. There are 2 bags. First Bag contains 3 Red & 4 Black balls and the second bag contains 5 Red & 2 Black balls. One ball is picked from each of the bags. Find the probability that both balls are of :

(i) Same colour

(a) $\frac{13}{34}$ (b) $\frac{23}{49}$
(c) $\frac{11}{21}$ (d) $\frac{11}{34}$

(ii) Different colour

(a) $\frac{11}{34}$ (b) $\frac{26}{49}$
(c) $\frac{23}{49}$ (d) $\frac{11}{34}$

55. A box contains 5 green , 4 yellow and 3 white marbles. Three marbles are drawn at random. What is the probability that they are of the same colour ?

(a) $\frac{13}{34}$ (b) $\frac{23}{49}$
(c) $\frac{11}{21}$ (d) $\frac{3}{44}$

56. A bag contains 6 red balls, 5 yellow balls and 3 pink balls. Two balls are drawn at random. What is the probability that none of the balls are red?

(a) $\frac{13}{34}$ (b) $\frac{4}{13}$
(c) $\frac{11}{21}$ (d) $\frac{3}{44}$

57. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

(a) $\frac{13}{34}$ (b) $\frac{10}{21}$
(c) $\frac{11}{21}$ (d) $\frac{3}{44}$

58. A bag contains 3 red balls, 5 yellow balls and 7 pink balls. If 1 ball is drawn at random from the bag, what is the Probability that it is pink or red in colour?

(a) $\frac{13}{34}$ (b) $\frac{10}{21}$
(c) $\frac{2}{3}$ (d) $\frac{3}{44}$

59. A bag contains 6 red balls, 4 green balls and 8 yellow balls. Three balls are drawn at random from the bag. What is the probability that two balls are red and one ball is green?

(a) $\frac{5}{68}$ (b) $\frac{10}{21}$
(c) $\frac{2}{3}$ (d) $\frac{3}{44}$

60. A bag contains 4 white, 4 red and 2 green balls. Two balls are drawn at random. What is the probability that at least one balls is green?

(a) $\frac{17}{45}$ (b) $\frac{10}{21}$
(c) $\frac{2}{3}$ (d) $\frac{3}{44}$

61. A bag contains 3 red, 6 white and 7 black balls. Three balls are drawn at random, then find the probability that all the three balls are black?

(a) $\frac{1}{12}$ (b) $\frac{1}{11}$
(c) $\frac{1}{18}$ (d) $\frac{1}{16}$

62. A basket contains three blue and four red balls. If three balls are drawn at random from the basket, what is the probability that all three are either blue or red?

(a) $\frac{1}{12}$ (b) $\frac{1}{7}$
(c) $\frac{1}{18}$ (d) $\frac{1}{16}$

63. A box contains 6 white balls and 7 black balls. Two balls are drawn at random. What is the probability the both of them are of different colours?

(a) $\frac{4}{13}$ (b) $\frac{2}{13}$
(c) $\frac{6}{13}$ (d) $\frac{7}{13}$

64. An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black?

(a) $\frac{2}{7}$ (b) $\frac{3}{7}$
(c) $\frac{4}{7}$ (d) $\frac{5}{7}$

65. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

(a) $\frac{10}{21}$ (b) $\frac{6}{21}$
(c) $\frac{10}{14}$ (d) $\frac{5}{7}$

66. A bag contains balls number 1, 2, 3.........20. One ball is drawn from the bag at random. What is the probability that the number on the balls drawn is divisible by 3 or 5?

(a) $\frac{2}{5}$ (b) $\frac{1}{2}$
(c) $\frac{9}{20}$ (d) $\frac{1}{10}$

67. A box contains 6 white, 2 black and 3 red balls. If a balls is drawn at random, what is the probability that it will not be white.

(a) $\frac{5}{6}$ (b) $\frac{6}{5}$
(c) $\frac{5}{11}$ (d) $\frac{6}{11}$

68. A bag contains balls numbered 1, 2, 3,........30. One ball is drawn from the bag at random. What is the probability that the number on the ball drawn is divisible by 4 or 6?

(a) $\frac{1}{15}$ (b) $\frac{1}{3}$
(c) $\frac{3}{10}$ (d) $\frac{2}{5}$

69. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

(a) $\frac{3}{4}$ (b) $\frac{4}{7}$
(c) $\frac{1}{8}$ (d) $\frac{3}{7}$

70. A box contains 4 red balls, 5 green balls and 6 white balls. A ball is drawn at random from the box. What is the probability that the ball drawn is either red or green?

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$
(c) $\frac{1}{5}$ (d) $\frac{7}{15}$

71. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

(a) $\frac{1}{3}$ (b) $\frac{3}{4}$
(c) $\frac{7}{19}$ (d) $\frac{8}{21}$

72. A bag contains 6 white and 4 red balls. Three balls are drawn at random. What is the probability that one ball is red and the other two are white?

(a) $\frac{1}{2}$ (b) $\frac{1}{12}$
(c) $\frac{3}{10}$ (d) $\frac{7}{12}$

73. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:

(a) $\frac{1}{22}$ (b) $\frac{3}{22}$
(c) $\frac{2}{91}$ (d) $\frac{2}{77}$

74. A box contains 2 black, 6 green and 4 yellow balls. If 2 balls are picked up at random, the probability that both are green-coloured is:

(a) $\frac{5}{22}$
(b) $\frac{3}{22}$
(c) $\frac{1}{22}$
(d) $\frac{3}{11}$

◆ TYPE – VI ◆
SET THEORY & VENN DIAGRAM

$P(A) \rightarrow$ Probability of event A

$P(B) \rightarrow$ Probability of event B

$P(A \cup B) \rightarrow$ Probability of event A or B

$P(A \cap B) \rightarrow$ Probability of event A & B

Important Result:

- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - (B \cap C) - P(C \cap A) + P(A \cap B \cap C)$
- $P(\bar{A}) = 1 - P(A)$
- $P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B)$ OR $P(\overline{A \cup B})$
- $P(\bar{A} \cup \bar{B}) = 1 - P(A \cap B)$ OR $P(\overline{A \cap B})$

How to check the given probabilities are consistently defined:

To check if given events are consistently defined, you need to verify if the probability of the intersection of two events (A and B) is less than or equal to the probability of each individual event $P(A \cap B) \le P(A)$ and $P(A \cap B) \le P(B)$

Basic rule:

If $P(A \cap B) > P(A)$ or $P(A \cap B) > P(B)$, then the events are not consistently defined.

Ex: Check whether the following probabilities P(A) and P(B) are consisitently defined:

$P(A) = 0.5, P(B) = 0.7, P(A \cap B) = 0.6$

Sol: Here, $P(A \cap B)$ (0.6) is greater than P(A) (0.5), so these events are **not consistently defined.**

Ex: Check whether the following probabilities P(A) and P(B) are consisitently defined:

$P(A) = 0.5, P(B) = 0.4, P(A \cup B) = 0.8$

Sol: To check consistency, we need to calculate $P(A \cap B)$ using the formula

$\Rightarrow P(A \cap B) = P(A) + P(B) - P(A \cup B)$
$= 0.5 + 0.4 - 0.8 = 0.1$

Since $P(A \cap B)$ is less than both P(A) and P(B), these events are considered **consistently defined.**

75. If E_1 and E_2 are two events such that $P(E_1) = 0.5$, $P(E_2) = 0.3$ and $P(E_1$ and $E_2) = 0.1$, find.

(i) $P(E_1$ or $E_2)$
(a) 0.5 (b) 0.6
(c) 0.7 (d) 0.8

(ii) $P(E_1$ but not $E_2)$
(a) 0.2 (b) 0.4
(c) 0.3 (d) 0.1

(iii) $P(E_2$ but not $E_1)$
(a) 0.2 (b) 0.1
(c) 0.4 (d) 0.3

(iv) P(neither E_1 but not $E_2)$
(a) 0.2 (b) 0.1
(c) 0.4 (d) 0.3

76. A and B are two events such that $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.35$. Find

(i) $P(A \cap B')$
(a) 0.18 (b) 0.19
(c) 0.17 (d) 0.14

(ii) $P(A' \cap B)$
(a) 0.24 (b) 0.14
(c) 0.34 (d) 0.44

(iii) $P(A' \cap B')$
(a) 0.8 (b) 0.14
(c) 0.16 (d) 0.12

(iv) $P(A' \cup B)$
(a) 0.71 (b) 0.91
(c) 0.81 (d) 0.96

(v) $P(A \cup B')$
(a) 0.66 (b) 0.76
(c) 0.64 (d) 0.74

(vi) $P(A' \cup B')$
(a) 0.75 (b) 0.65
(c) 0.85 (d) 0.95

77. If A and B are events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{8}$. Find $P(\bar{A} \cap \bar{B})$.
(a) $\frac{5}{8}$ (b) $\frac{3}{8}$
(c) $\frac{7}{8}$ (d) $\frac{1}{8}$

78. If A and B are events with $P(A) = \frac{3}{8}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$. Find $P(\bar{A} \cap \bar{B})$.

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(a) $\frac{5}{8}$ (b) $\frac{3}{8}$
(c) $\frac{7}{8}$ (d) $\frac{1}{8}$

79. In Class XI of a school, 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology.
(a) 0.5 (b) 0.4
(c) 0.6 (d) 0.02

80. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8, and the probability of passing the second examination is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both?
(a) 0.44 (b) 0.33
(c) 0.22 (d) 0.55

81. The probability that a student will pass the final examination in both English and Hindi is 0.5, and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination?
(a) 0.73 (b) 0.65
(c) 0.85 (d) 0.55

82. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that

(i) The student opted for NCC or NSS
(a) $\frac{19}{29}$ (b) $\frac{19}{20}$
(c) $\frac{19}{22}$ (d) $\frac{19}{30}$

(ii) The student has opted for neither NCC nor NSS
(a) $\frac{19}{30}$ (b) $\frac{11}{30}$
(c) $\frac{11}{29}$ (d) $\frac{19}{22}$

(iii) The student has opted for NSS but not NCC
(a) $\frac{2}{15}$ (b) $\frac{1}{15}$
(c) $\frac{2}{18}$ (d) $\frac{2}{13}$

83. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that–

(i) Both Anil and Ashima will not qualify the examination
(a) 0.85 (b) 0.87
(c) 0.84 (d) 0.89

(ii) Atleast one of them will not qualify the examination and
(a) 90.4 (b) 0.96
(c) 0.98 (d) 0.97

(iii) Only one of them will qualify the examination.
(a) 0.5 (b) 0.10
(c) 0.09 (d) 0.11

84. The probability that a student passes the mathematics exam is $\frac{3}{4}$ and the probability that he passes both mathematics and physics exams is $\frac{13}{36}$. The probability that he passes at least one exam is $\frac{5}{6}$. What is the probability that he passes the physics exam?

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(a) $\frac{5}{36}$ (b) $\frac{5}{9}$
(c) $\frac{4}{9}$ (d) $\frac{7}{9}$

85. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing atleast one of them is 0.95. What is the probability of passing both?
(a) 0.65 (b) 0.55
(c) 0.50 (d) 0.60

86. The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination ?

(a) 0.60 (b) 0.65
(c) 0.70 (d) 0.55

87. Two students karan and Anjali appeared in an examination. The probability that karan will qualify the examination is 0.05 and that Anjali will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that Both karan and Anjali will not qualify the examination.

(a) 0.87 (b) 0.86
(c) 0.88 (d) 0.89

88. Two students Ajay and Rani appeared in an examination. The probability that Ajay will qualify the examination is 0.05 and that Rani will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that atleast one of them will not qualify the examination.

(a) 0.98 (b) 0.97
(c) 0.96 (d) 0.95

89. In class 11 of a school, 40 students opted for Physics, 17 for Biology and 20 for Chemistry. If the total number of students in class 11 was 60, and all these students chose at least one of the three subjects mentioned here, and exactly five of these students chose all the three subjects, then what is the probability that A randomly selected student of class 11 of the school will have chosen exactly one subject out of these three subjects?

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(a) 0.85 (b) 0.90
(c) 0.75 (d) 0.80

90. In class 10 of a school, 13 students opted for only Badminton, 10 opted for only Table Tennis and 12 for only Volleyball. If the total number of students in class 10 was 55 and students who opted for only badminton and table tennis are x, who opted for only table tennis & Volleyball are x and who opted for only Badminton & Volleyball are x-3.

Students who opted for all of these are $x + 3$.

(i) Find the probability the selected member did not choose volleyball.

(a) $\frac{35}{60}$ (b) $\frac{42}{55}$
(c) $\frac{28}{60}$ (d) $\frac{27}{59}$

◆ TYPE – VII ◆
ODDS (IN FAVOUR & AGAINST)

Definition of Odds:

Odds in probability of a particular event, means the ratio between the number of favorable outcomes to the number of unfavorable outcomes.

➤ Odds in favour of event A

Odds in favor of a particular event are given by Number of favorable outcomes to Number of unfavorable outcomes.

$$\frac{n(A)}{n(S)-n(A)} = \frac{P(A)}{1-P(A)} \text{ OR } \frac{P(A)}{P(A')}$$

➤ Odds against event A

Odds against is given by Number of unfavorable outcomes to number of favorable outcomes.

$$\frac{n(S)-n(A)}{n(A)} = \frac{1-P(A)}{P(A)} \text{ OR } \frac{P(A')}{P(A)}$$

91. If the probability of the occurrence of a certain event E is $\frac{3}{11}$, find.

(i) The odds in favour of its occurrence.

(a) 3 : 8 (b) 8 : 3
(c) 11 : 3 (d) 3 : 11

(ii) The odds against its occurrence.

(a) 8 : 3 (b) 3 : 8
(c) 11 : 3 (d) 3 : 11

92. The odds in favour of occurrence of an event are 5 : 12. Find the probability of the occurrence of this event.

(a) $\frac{1}{6}$ (b) $\frac{5}{17}$
(c) $\frac{12}{5}$ (d) $\frac{5}{12}$

93. If the odds in favour of an event be $\frac{3}{5}$, find the probability of the occurrence of the event.

(a) $\frac{3}{8}$ (b) $\frac{5}{8}$
(c) $\frac{3}{5}$ (d) $\frac{5}{3}$

94. If the odds against the occurrence of an event be 4 : 7, find the probability of the occurrence of the event.

(a) $\frac{4}{11}$ (b) $\frac{7}{11}$
(c) $\frac{7}{4}$ (d) $\frac{11}{7}$

95. If the favorable odds for an event to occur is 4 : 5, what will be the probability that this event will not occur?

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(a) $\frac{5}{9}$ (b) $\frac{1}{5}$
(c) $\frac{4}{5}$ (d) $\frac{4}{9}$

96. In a single toss of a fair dice, what are the odds against the event that number 3 or 4 turns up?

(a) 1 : 2 (b) 2 : 1
(c) 3 : 2 (d) 2 : 3

97. Two dice are thrown. Find.

(i) The odds in favour of getting the sum 5.

(a) $\frac{1}{9}$ (b) $\frac{1}{8}$
(c) $\frac{4}{36}$ (d) $\frac{5}{31}$

(ii) The odds against getting the sum 6.

(a) $\frac{5}{31}$ (b) $\frac{6}{30}$
(c) $\frac{31}{5}$ (d) $\frac{1}{6}$

98. A card is drawn from a well-shuffled deck of 52 cards. Find.

(i) The odds in favour of getting a face:

(a) $\frac{4}{9}$ (b) $\frac{3}{10}$
(c) $\frac{4}{12}$ (d) $\frac{10}{12}$

(ii) The odds against getting a spade:

(a) $\frac{13}{39}$ (b) $\frac{39}{13}$
(c) $\frac{1}{3}$ (d) $\frac{3}{1}$

99. If $P(A \cup B) = \frac{5}{9}$, $P(\overline{A} \cup \overline{B}) = \frac{13}{27}$, $P(A) = \frac{11}{18}$, then the odds against the event B are:

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(a) $\frac{47}{7}$ (b) $\frac{7}{57}$
(c) $\frac{38}{17}$ (d) $\frac{29}{25}$

100. The odds against an event is 4 : 5 and the odds in favour of another event is 3 : 7. If both the events are independent, then the probability that at least one of the event will happen is?

(a) $\frac{31}{45}$ (b) $\frac{77}{90}$
(c) $\frac{1}{6}$ (d) $\frac{5}{6}$

101. The odds against a certain event is 5 : 2 and the odds in fovour of another event, independent to the former is 6 : 5. Find the probability that

(i) At least one of the events will occur.

(a) $\frac{52}{77}$ (b) $\frac{47}{67}$
(c) $\frac{47}{77}$ (d) $\frac{52}{67}$

(ii) None of the events will occur.

(a) $\frac{52}{77}$ (b) $\frac{25}{77}$

(c) $\frac{47}{77}$ (d) $\frac{23}{77}$

102. The odds against student X solving a statistics problem are 8 : 6 and odds in favour of student Y solving the same problem are 14 : 16. Find is the chance that neither of them solves the problem.

(a) $\frac{52}{105}$ (b) $\frac{25}{77}$

(c) $\frac{47}{77}$ (d) $\frac{32}{105}$

103. The odds against a certain event are 5 : 2 and the odds in favour of an other event independent of the former are 6 : 5. The probability that none of the events will happen is.

(a) $\frac{25}{77}$ (b) $\frac{12}{77}$

(c) $\frac{52}{77}$ (d) $\frac{5}{77}$

104. The odds in favour of a person A to clear the interview is $\frac{7}{9}$ and the odds in against of another person B to clear the interview is $\frac{5}{7}$, then what is odd in favour that either of the persons is cleared or both cleared the interview?

(a) $\frac{49}{15}$ (b) $\frac{39}{14}$

(c) $\frac{15}{49}$ (d) $\frac{98}{70}$

105. In solving any problem, odds against A are 4 : 3 and in favour of B in solving the same is 7 : 5. Then what is odd in favour that problem will be solved is?

(a) $\frac{16}{5}$ (b) $\frac{5}{16}$

(c) $\frac{16}{21}$ (d) $\frac{5}{21}$

• TYPE – VIII •
CONDITIONAL PROBABILITY

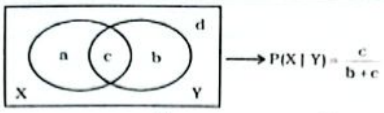
If X and Y are two events belonging to the same sample space of a random experiment, then the conditional probability of event X when event Y has already occurred is denoted by P(X | Y) and calculated using the following formula.

$$P(X\mid Y)=\frac{P(X\cap Y)}{P(Y)},P(Y)\neq 0$$

Similarly, When the probability of Y given X is

$$P(Y\mid X)=\frac{P(X\cap Y)}{P(X)},P(X)\neq 0$$

Graphical representation of conditional probability



106. If P (A) = $\frac{7}{13}$, P (B) = $\frac{9}{13}$ and P(A ∩ B) = $\frac{4}{13}$, evaluate P (A | B).

(a) $\frac{4}{9}$ (b) $\frac{4}{7}$

(c) $\frac{5}{2}$ (d) $\frac{4}{5}$

107. If A and B are events such that P(A) = 0.6, P(B) = 0.3 and P(A ∩ B) = 0.2, find.

(i) P(A | B)

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$

(c) $\frac{4}{4}$ (d) $\frac{3}{4}$

(ii) P(B | A)

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$

(c) $\frac{4}{4}$ (d) $\frac{3}{4}$

108. If P (A | B) = $\frac{1}{2}$, P (B | A) = $\frac{1}{3}$ & P (A ∩ B) = $\frac{1}{6}$ then find the value of P (A ∪ B).

(a) $\frac{2}{3}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{4}{5}$

109. If $(\bar{A})$ = 0.3, P (B) = 0.4, P $(A\cap\bar{B})$ = 0.5 the find $P(B\mid A\cup\bar{B})$.

(a) $\frac{1}{4}$ (b) $\frac{1}{8}$

(c) $\frac{4}{5}$ (d) $\frac{1}{3}$

110. A family has two children. What is the probability that both the children are boys given that at least one of them is a boy?

(a) $\frac{2}{3}$ (b) $\frac{1}{5}$

(c) $\frac{1}{4}$ (d) $\frac{1}{3}$

111. Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that the number on the drawn card the is more than 3, what is the probability that is an even number?

(a) $\frac{2}{3}$ (b) $\frac{4}{7}$

(c) $\frac{4}{5}$ (d) $\frac{1}{3}$

112. A committee of 4 students is selected at random from a group consisting 8 boys and 4 girls. Given that there is at least one girl in the committee, calculate the probability that there are exactly 2 girls on the committee.

(a) $\frac{166}{422}$ (b) $\frac{160}{421}$

(c) $\frac{5}{2}$ (d) $\frac{168}{425}$

113. There are 10 cards, 5 of these have 'I' & other 5 have 'T' printed on them. 3 cards are drawn one by one without replacement & are kept in same order, then probability of making the word IIT is.

(a) $\frac{5}{30}$ (b) $\frac{5}{36}$

(c) $\frac{5}{35}$ (d) $\frac{5}{32}$

➤ **Mutually Exclusive Events**

Definition: Two events A and B are mutually exclusive if they cannot happen together, i.e.,

P(A ∩ B) = 0

Mathematical Condition:

P(A ∪ B) = P(A) + P(B), (since P(A ∩ B) = 0

Ex: If P(A) = $\frac{3}{5}$ and P(B)= $\frac{1}{5}$, find P (A ∪ B) if A and B are mutually exclusive.

Sol: Since A and B are mutually exclusive,

$$P(A\cup B)=P(A)+P(B)=\frac{3}{5}+\frac{1}{5}=\frac{4}{5}$$

114. Let A B are two mutually exclusive events with P(A) = $\frac{1}{3}$ and P(B) = $\frac{1}{4}$. What is the value of $P(\bar{A}\cap\bar{B})$?

(a) $\frac{1}{6}$ (b) $\frac{1}{4}$

(c) $\frac{1}{3}$ (d) $\frac{5}{12}$

115. For two mutually exclusive events A and B P(A) = 0.2 and $P(\bar{A}\cap\bar{B})=0.3$. What is P(B) equal to?

(a) $\frac{1}{2}$ (b) $\frac{2}{5}$

(c) $\frac{2}{7}$ (d) $\frac{2}{3}$

116. A, B, C and D are mutually exclusive and exhaustive events. If 2P(A) = 3P(B) = 4P(C) = 5P(D), then what is 77P(A) equal to?

(a) 12 (b) 15

(c) 20 (d) 30

➤ **Independent Events**

Definition: Two events A and B are independent if the occurrence of one does not affect the occurrence of the other.

Mathematical Condition:

P(A ∩ B) = P(A) × P(B)

Ex: If P(A) = $\frac{1}{3}$ and P(B) = $\frac{1}{2}$, find = P(A ∩ B) if A and B are independent.

Sol: Since A and B are independent,

P(AnB) = P(A ∩ B) = P(A) × P(B)

$$=\frac{1}{3}\times\frac{1}{2}=\frac{1}{6}$$

117. A and B are two independent events. If P(A) = 0.4 and P(B) = 0.6, then P(A or B) will be ________

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(a) 0.78 (b) 0.66
(c) 0.68 (d) 0.76

118. Two independent event A and B are such that $P(A \cup B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$. If P(B) < P(A), then what is P(B) equal to?

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$
(c) $\frac{1}{2}$ (d) $\frac{1}{6}$

119. Suppose P(A) = 0.4, P(B) = P and $P(A \cup B) = 0.7$. If A and b are independent events, then the value of P is.

(a) 0.5 (b) 0.3
(c) 0.55 (d) 0.6

➢ **Dependent Events**

Definition: Two events A and B are dependent if the occurrence of one affects the probability of the other.

Mathematical Condition:

$P(A \cap B) = P(A) \times P(B \mid A)$

Ex: A bag contains 10 balls (6 red, 4 blue). A ball is drawn without replacement such that

Event A : First ball is red.

Event B : Second ball is blue.

Find $P(A \cap B)$.

Sol: $P(A) = \frac{6}{10}$

If a red ball is drawn first, only 9 balls remain (4 blue).

$P(B \mid A) = \frac{4}{9}$

Since these are dependent events,

$P(A \cap B) = P(A) \times P(B \mid A)$

$= \frac{6}{10} \times \frac{4}{9} = \frac{24}{90} = \frac{4}{15}$

120. A box has 5 red and 3 green balls. Two balls are drawn without replacement. What is $P(A \cap B)$, where:

A: First ball is red

B: Second ball is green

(a) $\frac{3}{8}$ (b) $\frac{5}{8}$
(c) $\frac{15}{56}$ (d) $\frac{5}{28}$

121. If A and B are two events such that $P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$ & $P(B) = \frac{1}{2}$, then the events A and B are ____.

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(a) Not Mutually Exclusive
(b) Mutually Exclusive
(c) Independent
(d) Dependent

122. If A and B are two events such that $P(A^C \cup B) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ & $P(A^C) = \frac{1}{4}$, then the events A and B are ____.

(a) Independent
(b) Mutually Exclusive
(c) Dependent
(d) Not mutually exclusive

123. If P(A) = 0.4, P(B) = 0.5, & $P(A \cup B) = 0.7$, then events A and B are:

(a) Mutually exclusive
(b) Not mutually exclusive
(c) Independent
(d) Dependent

124. If A and B are two events such that $(A \cup B)^C = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ & $P(A^c) = \frac{1}{4}$, then the events A & B are ____.

(a) Mutually exclusive and independent
(b) Equally likely but not independent
(c) Independent but not equally likely
(d) Independent and equally likely

125. If A and B are two events such that $P(A \cup B)^c = \frac{1}{4}$, $P(A \cap B) = \frac{1}{5}$ & $P(A^c) = \frac{1}{2}$, then the events A & B are ____.

(a) Mutually exclusive and independent
(b) Equally likely but not independent
(c) Independent but not equally likely
(d) Independent and equally likely

◆ TYPE – IX ◆
BAYE'S THEOREM

We know that,

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} \quad \text{...(i)}$$

$$\& \; P(B \mid A) = \frac{P(A \cap B)}{P(A)} \quad \text{...(ii)}$$

From (i) & (ii), we get–

$$\boxed{P(A \mid B) = \frac{P(A) \times P(B \mid A)}{P(B)}}$$

This is called Baye's theorem. It is a relation between P(A | B) & P(B | A). Here outcome is not asked but it is given.

GENERAL FORM

$$P\left(\frac{E_1}{A}\right) = \frac{P(E_1) \times P\left(\frac{A}{E_1}\right)}{\sum_{r=1}^{n} P(E_r) \times P\left(\frac{A}{E_r}\right)}$$

Note: Whenever the outcome of an experiment is given & probability of it being occurring through a particular path is asked, then Baye's theorem is applied. Paths are denoted by E_i's & outcome is denoted by A.

126. Amy has two bags. Bag 1st has 7 red and 4 blue balls and bag 2nd has 5 red and 9 blue balls. Amy draws a ball at random and it turn out be red. Determine the probability that the ball was from the bag I.

(a) 0.64 (b) 0.65
(c) 0.66 (d) 0.66

127. Box I contains 2 white and 3 blue balls, box II contains 4 white and 2 blue balls and box III contains 1 white and 3 blue balls. Probabilities of box I, II & III being selected is 0.2, 0.3 & 0.5 respectively. A ball is drawn at random & is found to be white. Find the probability that it came from box I.

(a) $\frac{16}{81}$ (b) $\frac{16}{80}$
(c) $\frac{16}{85}$ (d) $\frac{16}{82}$

128. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$
(c) $\frac{3}{8}$ (d) $\frac{4}{5}$

129. A man is known to speak truth $\frac{3}{4}$ times. He draws a card and reports it is king. Find the probability that it is actually a king.

(a) 0.51 (b) 0.50
(c) 0.55 (d) 0.56

◆ TYPE – X ◆
MISCELLANEOUS QUESTIONS

130. Let A and B be two players who are playing the game to hit the target. The probabilities of hitting the target by A and B is $\frac{2}{3}$ and $\frac{3}{4}$, respectively. What is the probability that exactly one of them hit the target?

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(a) $\frac{7}{12}$ (b) $\frac{1}{4}$
(c) $\frac{1}{12}$ (d) $\frac{5}{12}$

131. The probability of A and B clearing an exam is $\frac{2}{3}$ and $\frac{3}{4}$ respectively. What is the probability that atleast one of them pass the exam ?

(a) $\frac{11}{12}$ (b) $\frac{11}{15}$
(c) $\frac{11}{14}$ (d) $\frac{11}{18}$

132. A problem is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{3}{4}$ (d) $\frac{4}{5}$

133. Let A and B be two players who are playing the game to hit the target. The probabilities of hitting the target by A & B is $\frac{2}{3}$ & $\frac{3}{4}$, respectively. What is the probability that exactly one of them hit the target?

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(a) $\frac{7}{12}$ (b) $\frac{1}{4}$

(c) $\frac{1}{12}$ (d) $\frac{5}{12}$

134. The probability that three students A, B & C solve a problem are $\frac{3}{7}, \frac{5}{9}$ & $\frac{1}{5}$ respectively. What is the probability that the problem is solved?

(a) $\frac{251}{315}$ (b) $\frac{250}{314}$

(c) $\frac{249}{310}$ (d) $\frac{250}{312}$

135. A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\left(\frac{1}{7}\right)$ and the probability of wife's selection is $\left(\frac{1}{5}\right)$. What is the probability that only one of them is selected ?

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{2}{7}$

136. A brother and a sister appear for an interview against two vacant posts in an office. The probability of the brother's selection is $\frac{1}{5}$ & that of the sister's selection is $\frac{1}{3}$. What is the probability that only one of them is selected?

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{2}{5}$ (d) $\frac{2}{7}$

137. A speaks truth in 75% of cases and B in 80% of cases. What is the probability that they likely to contradict each other, narrating the same incident.

(a) $\frac{7}{23}$ (b) $\frac{7}{15}$

(c) $\frac{7}{25}$ (d) $\frac{7}{20}$

138. A speaks the truth 5 out of 7 times and B speaks truth 8 out of 9 times. What is the probability that they contradict each other in stating the same fact?

(a) $\frac{3}{7}$ (b) $\frac{1}{3}$

(c) $\frac{5}{2}$ (d) $\frac{2}{7}$

139. A speaks truth in 80% of the cases and B speaks truth in 60% of the cases. Find the probability that they contradict each other in narrating an incident.

(a) $\frac{7}{23}$ (b) $\frac{11}{22}$

(c) $\frac{11}{25}$ (d) $\frac{7}{20}$

140. A speaks the truth 5 out of 7 times and B speaks truth 8 out of 9 times. What is the probability that they contradict each other in stating the same fact?

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(a) $\frac{1}{7}$ (b) $\frac{1}{9}$

(c) $\frac{1}{4}$ (d) $\frac{1}{3}$

141. A speaks truth in 75% cases and B in 80% of the cases. In what percentage of cases are they likely to contradict each other narrating the same incident ?

(a) 5% (b) 15%

(c) 35% (d) 45%

142. A man is known to speak the truth 3 out of 5 times. He throws a dice and reports that it is '1'. Find the probability that it is actually 1.

(a) $\frac{3}{13}$ (b) $\frac{1}{8}$

(c) $\frac{4}{8}$ (d) $\frac{1}{13}$

143. A man speaks truth 2 out of 3 times He picks one of the natural numbers in the set S = (1, 2, 3, 4, 5, 6, 7) and reports that it is even. The probability that it is actually even is

(a) $\frac{2}{5}$ (b) $\frac{1}{5}$

(c) $\frac{1}{10}$ (d) $\frac{3}{5}$

144. The probability of solving a problem by three students A, B and C are $\frac{3}{7}, \frac{5}{9}$ & $\frac{1}{5}$ respectively. What is the probability that the problem is solved?

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(a) $\frac{64}{315}$ (b) $\frac{32}{315}$

(c) $\frac{251}{315}$ (d) $\frac{155}{315}$

145. Sudarshan and Abraham appeared for interviews for two vacancies. The probability of Sudarshan's selection is $\frac{1}{3}$ and the probability of Abraham's selection is $\frac{1}{5}$. Find the probability that none of them is selected.

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(a) $\frac{8}{15}$ (b) $\frac{14}{15}$

(c) $\frac{1}{15}$ (d) $\frac{22}{15}$

146. In a cricket world cup the probability that India will win the cup is $\frac{1}{4}$. The probability of Pakistan winning the cup is $\frac{1}{5}$ and of Australia winning the cup is $\frac{1}{6}$. What is the probability that either of these 3 teams India, Pakistan and Australia would win the world cup ?

Note: Only one team can win the cup

(a) $\frac{30}{60}$ (b) $\frac{37}{60}$

(c) $\frac{20}{34}$ (d) $\frac{27}{34}$

147. A problem is given to three students A, B and C whose probabilities of 1 solving the problem independently are $\frac{1}{2}, \frac{1}{3}$ and p respectively. If the probability that the problem can be solved is $\frac{29}{32}$ then what is the value of p?

(a) $\frac{3}{32}$ (b) $\frac{17}{32}$

(c) $\frac{23}{32}$ (d) $\frac{29}{32}$

148. Find the probability that a number selected at random from first hundred natural numbers is a multiple of 3 or 5?

(a) $\frac{47}{100}$ (b) $\frac{57}{100}$

(c) $\frac{37}{100}$ (d) $\frac{8}{89}$

149. Two letters are chosen from English Alphabet. What is the probability that both are vowels.

(a) $\frac{27}{34}$ (b) $\frac{11}{22}$

(c) $\frac{2}{65}$ (d) $\frac{7}{23}$

150. A letter is taken out at random from 'ASSISTANT' and another is taken out from 'STATISTICS'. What is the probability that they are the same letter.

(a) $\frac{19}{90}$ (b) $\frac{17}{89}$

(c) $\frac{20}{34}$ (d) $\frac{29}{87}$

151. Find the probability that a leap year will have:

(i) Atleast 52 Sundays

(a) 1 (b) 6

(c) 2 (d) 4

(ii) Exactly 52 Sundays

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{5}{7}$ (d) $\frac{4}{5}$

(iii) Exactly 53 Sundays

(a) $\frac{3}{7}$ (b) $\frac{3}{5}$

(c) $\frac{5}{2}$ (d) $\frac{2}{7}$

152. Out of 17 applicants 8 boys and 9 girls. Two persons are to be selected for the job. Find the probability that at least one of the selected persons will be a girl.

(a) $\frac{7}{23}$ (b) $\frac{11}{22}$

(c) $\frac{20}{34}$ (d) $\frac{27}{34}$

153. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected is:

(a) $\frac{21}{46}$ (b) $\frac{25}{117}$

(c) $\frac{1}{50}$ (d) $\frac{3}{25}$

154. A basket contains 10 apples and 20 oranges out of which 3 apples and 5 oranges are defective. If we choose two fruits at random, what is the probability that either both are oranges or both are non defective?

(a) $\frac{316}{435}$ (b) $\frac{315}{430}$

(c) $\frac{315}{432}$ (d) $\frac{315}{423}$

155. A word consists of 9 letters; 5 consonants and 4 vowels. Three letters are chosen at random. What is the probability that more than one vowel will be selected ?

(a) $\frac{27}{34}$ (b) $\frac{11}{22}$

(c) $\frac{2}{65}$ (d) $\frac{17}{42}$

156. Five salesmen A,B,C,D and E of a company are considered for a three member trade delegation to represent the company at an international trade conference. What is the probability that A gets selected ?

(a) $\frac{3}{5}$ (b) $\frac{2}{5}$

(c) $\frac{4}{5}$ (d) $\frac{1}{5}$

157. A number x is selected from the numbers 1, 2, 3 and then a second number y is randomly selected from the numbers 1, 4, 9. What is the probability that the product xy of the two numbers will be less than 9?

(a) $\frac{5}{6}$ (b) $\frac{4}{5}$

(c) $\frac{5}{9}$ (d) $\frac{1}{2}$

158. The probability that a man who is 45 years old will be alive till he becomes 70 is $\frac{5}{12}$. The probability that his wife who is 40 years old will be alive till she becomes 65 is $\frac{3}{8}$. What is the probability that, 25 years hence–

(i) The couple will be alive

(a) $\frac{5}{30}$ (b) $\frac{5}{33}$

(c) $\frac{5}{35}$ (d) $\frac{5}{32}$

(ii) Exactly one of them will be alive

(a) $\frac{23}{41}$ (b) $\frac{23}{40}$

(c) $\frac{23}{48}$ (d) $\frac{20}{45}$

(iii) None of them will be alive

(a) $\frac{30}{91}$ (b) $\frac{32}{90}$

(c) $\frac{30}{95}$ (d) $\frac{35}{96}$

(iv) At least one of them will be alive

(a) $\frac{61}{96}$ (b) $\frac{60}{96}$

(c) $\frac{30}{95}$ (d) $\frac{35}{96}$

159. A person can hit a target 5 times out of 8 shots. If he fires 10 shots, what is the probability that he will hit the target twice?

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(a) $\frac{1125\times3^8}{8^{10}}$ (b) $\frac{1125\times3^8}{8^{11}}$

(c) $\frac{1120\times3^8}{8^{10}}$ (d) $\frac{1120\times3^8}{8^{11}}$

160. In a biased coin the probability of getting a head is 0.4, if we toss a coin 10 times, what is the probability of getting exactly three heads?

(a) $\frac{2^6\times3^8}{5^9}$ (b) $\frac{2^6\times3^5}{5^7}$

(c) $\frac{2^5\times3^4}{5^7}$ (d) $\frac{2^5\times3^3}{5^{11}}$

161. On the disc shown below, a player spins the arrow twice. The fraction, $\frac{a}{b}$ is formed, where a is the number of the sector where the arrow stops after the first spin and b is the number of sector where the arrow stops after the second spin. On every spin each of the numbered sector has an equal probability of being the sector on which the arrow stops. What is the probability that the fraction , $\frac{a}{b}$ is greater than 1?

(a) $\frac{5}{11}$ (b) $\frac{2}{13}$

(c) $\frac{5}{12}$ (d) $\frac{5}{18}$

162. In a bag, there are some red, black and yellow balls. Sum of black and yellow balls is 9. Probability of selecting two red balls from that bag is $\frac{1}{7}$ which is 250% of the probability of selecting two black balls. Find number of yellow balls in that bag if the number of black balls is even.

(a) 3 (b) 4

(c) 5 (d) 6

Chapter - 29 : Probability

ANSWER KEY

1.	(b)	2.	(b)	3.	(a)	4.	(d)	5.	(d)	6.	(a)	7.	(d)	8.	(c)	9.	(c)	10.(i)	(b)
(ii)	(a)	(iii)	(a)	(iv)	(a)	(v)	(d)	11.	(c)	12.(i)	(d)	(ii)	(a)	(iii)	(b)	13.	(c)	14.	(d)
15.	(a)	16.	(b)	17.	(b)	18.	(b)	19.(i)	(b)	(ii)	(a)	(iii)	(c)	20.(i)	(b)	(ii)	(a)	21.	(c)
22.(i)	(a)	(ii)	(c)	(iii)	(d)	(iv)	(b)	23.	(c)	24.	(b)	25.	(d)	26.	(a)	27.	(a)	28.	(a)
29.	(a)	30.	(a)	31.	(c)	32.	(b)	33.(i)	(a)	(ii)	(c)	(iii)	(b)	(iv)	(a)	(v)	(d)	34.(i)	(b)
(ii)	(c)	(iii)	(d)	(iv)	(d)	35.	(d)	36.	(c)	37.	(d)	38.(i)	(d)	(ii)	(b)	39.	(a)	40.(i)	(b)
(ii)	(d)	41.	(b)	42.	(d)	43.	(c)	44.	(c)	45.	(b)	46.	(c)	47.	(d)	48.	(b)	49.	(a)
50.	(b)	51.	(c)	52.	(b)	53.	(c)	54.(i)	(b)	(ii)	(b)	55.	(d)	56.	(b)	57.	(b)	58.	(c)
59.	(a)	60.	(a)	61.	(d)	62.	(b)	63.	(d)	64.	(b)	65.	(a)	66.	(c)	67.	(c)	68.	(b)
69.	(b)	70.	(b)	71.	(a)	72.	(a)	73.	(c)	74.	(a)	75.(i)	(c)	(ii)	(b)	(iii)	(a)	(iv)	(d)
76.(i)	(b)	(ii)	(c)	(iii)	(d)	(iv)	(c)	(v)	(a)	(vi)	(b)	77.	(b)	78.	(b)	79.	(c)	80.	(d)
81.	(b)	82.(i)	(d)	(ii)	(b)	(iii)	(a)	83.(i)	(b)	(ii)	(c)	(iii)	(d)	84.	(c)	85.	(b)	86.	(b)
87.	(a)	88.	(a)	89.	(d)	90.	(c)	91.(i)	(a)	(ii)	(a)	92.	(b)	93.	(a)	94.	(b)	95.	(a)
96.	(b)	97.(i)	(b)	(ii)	(c)	98.(i)	(a)	(ii)	(d)	99.	(d)	100.	(a)	101.(i)	(a)	(ii)	(b)	102.	(d)
103.	(a)	104.	(a)	105.	(a)	106.	(a)	107.(i)	(a)	(ii)	(b)	108.	(a)	109.	(a)	110.	(d)	111.	(b)
112.	(d)	113.	(b)	114.	(d)	115.	(a)	116.	(d)	117.	(d)	118.	(b)	119.	(a)	120.	(c)	121.	(c)
122.	(a)	123.	(b)	124.	(b)	125.	(b)	126.	(a)	127.	(a)	128.	(c)	129.	(b)	130.	(d)	131.	(a)
132.	(c)	133.	(d)	134.	(a)	135.	(d)	136.	(c)	137.	(d)	138.	(b)	139.	(c)	140.	(d)	141.	(c)
142.	(a)	143.	(d)	144.	(c)	145.	(a)	146.	(b)	147.	(c)	148.	(a)	149.	(c)	150.	(a)	151.(i)	(a)
(ii)	(c)	(iii)	(d)	152.	(d)	153.	(a)	154.	(a)	155.	(d)	156.	(a)	157.	(c)	158.(i)	(d)	(ii)	(c)
(iii)	(d)	(iv)	(a)	159.	(a)	160.	(a)	161.	(c)	162.	(c)								

SOLUTIONS

1. (b) $P(W) + P(\overline{W}) = 1$

$0.3 + P(\overline{W}) = 1 \Rightarrow P(\overline{W}) = 0.7$

2. (b) Natural numbers = 1, 2, 3...... 20
Prime number = 2, 3, 5, 7, 11, 13, 17, 19

Probability = $\frac{8}{20} = \frac{2}{5}$

3. (a) Total number of balls = 3 + 4 = 7
No. of white balls = 3

Probability = $\frac{3}{7}$

4. (d) Perfect square numbers between 2 and 90
= 4, 9, 16, 25, 36, 49, 64, 81

Probability = $\frac{8}{89}$

5. (d) Total no. of outcomes = 40
Favorable outcomes = 15
Then,

$P = \frac{15}{40} = \frac{3}{8}$

6. (a) Total no. of outcomes = 13
Favorable outcomes = 6

Then, $P = \frac{6}{13}$

7. (d) Total no. of outcomes = 600
Favorable outcomes = 588

$P = \frac{588}{600} = 0.98$

8. (c) A.T.Q.,

$= 2\left(\frac{x}{12}\right) = \frac{x+6}{18}$

$= 2(3x) = 2x + 12 = 4x = 12$

$x = 3$

9. (c) Let, B = Blue marbles in jar,
G = Green marbles in jar, and
W = White marbles in jar.
ATQ,

P(getting blue) = $\frac{1}{3}$

$\Rightarrow \frac{B}{54} = \frac{1}{3} \Rightarrow B = 18$

Again, P(getting green) = $\frac{4}{9}$

$\Rightarrow \frac{G}{54} = \frac{4}{9} \Rightarrow G = 24$

Total number of white marbles
= 54 – (18 + 24) = 12

10. Sample space = {(H,H) (H,T) (T,H) (T,T)}

(i) (b) P(two tails) = $\frac{1}{4}$ {T, T}

(ii) (a) P(one head) = $\frac{2}{4} = \frac{1}{2}$ {H, T} {T, H}

(iii) (a) P(at least one tail)
= $\frac{3}{4}$ {H, T} {T, H} {T, T}

(iv) (a) P(at most one tail)
= $\frac{3}{4}$ {H, T} {T, H} {H, H}

(v) (d) P(no tail) = $\frac{1}{4}$

11. (c) Sample space = {HT, TH, TT, HH}

Probability = $\frac{2}{4} = \frac{1}{2}$

12. Sample Space
= { HHH, HHT, HTH, THH, HTT, THT, TTH, TTT }

(i) (d) P(all heads) = $\frac{1}{8}$

(ii) (a) P(at least one tail) = $\frac{7}{8}$

(iii) (b) P(exactly 2 heads) = $\frac{3}{8}$

13. (c) Sample Space
= { HHH, HHT, HTH, THH, HTT, THT, TTH, TTT }

Probability = $\frac{6}{8} = \frac{3}{4}$

14. (d) Sample Space = {HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT}

Probability = $\frac{10}{16} = \frac{5}{8}$

Method-II:
Total cases = $2^4 = 16$
No. of unfavourable cases = ${}^4C_2$
$= \frac{4!}{2! \times 2!} = \frac{4.3.2!}{2!.2!} = 6$
favorable case = 16 – 6 = 10

$\therefore$ Required Probability = $\frac{10}{32} = \frac{5}{16}$

15. (a) Total cases = $2^5 = 32$
No. of favourable cases = ${}^5C_2$
$= \frac{5!}{2! \times 3!} = \frac{5.4.3!}{2! \times 3!} = 10$
Probability = $\frac{10}{32} = \frac{5}{16}$

16. (b) Total cases = $2^8 = 256$
No. of favorable cases = ${}^8C_6$
$= \frac{8!}{2! \times 6!} = \frac{8.7.6!}{2! \times 6!} = 28$
Probability = $\frac{28}{256} = \frac{7}{64}$

17. (b) Total cases = $2^9 = 512$
0 tail → ${}^9C_0 = \frac{9!}{9! \times 0!} = 1$
1 tail → ${}^9C_1 = \frac{9!}{8! \times 1!} = 9$
2 tail → ${}^9C_2 = \frac{9!}{7! \times 2!} = 36$
∴ Total no. of favourable cases
= 1 + 9 + 36 = 46
Probability = $\frac{46}{512} = \frac{23}{256}$

18. (b) Total cases = $2^7 = 128$
0T → ${}^7C_0 = 1$
1T → ${}^7C_1 = 7$
2T ✓
3T ✓
4T ✓
5T ✓
6T ✓
7T ✓
Favourable cases = 128 – (1 + 7) = 120
Probability = $\frac{120}{128} = \frac{15}{16}$

19. Sample space = {1, 2, 3, 4, 5, 6} = 6
(i) (b) Prime number = 2, 3, 5
Probability = $\frac{3}{6} = \frac{1}{2}$
(ii) (a) Multiple of 2 or 3 = 2, 3, 4, 6
Probability = $\frac{4}{6} = \frac{2}{3}$
(iii) (c) Numbers greater than 4 = 5, 6
Probability = $\frac{2}{6} = \frac{1}{3}$

20. Sample space = {1, 2, 3, 4, 5, 6} = 6
(i) (b) Number of favourable outcomes = 3(2, 4, 6)
∴ $P(E_1) = \frac{3}{6} = \frac{1}{2}$
(ii) (a) $P(E_2) = P(\bar{E}_1) = 1 - \frac{1}{2} = \frac{1}{2}$ or else, we can say $P(E_2)$
$= \frac{3}{6} = \frac{1}{2}$

21. (c) Sum = 7
Probability = $\frac{(13-7)}{36} = \frac{1}{6}$

22. Total number of possible cases = $6^2 = 36$
(i) (a) Sum = 8
Probability = $\frac{(13-8)}{36} = \frac{5}{36}$
(ii) (c) Alteast a sum of 9 means sum can be 9, 10, 11 or 12.
Favourable cases for 9 as sum = 13 – 9 = 4
Favourable cases for 10 as sum = 13 – 10 = 3
Favourable cases for 11 as sum = 13 – 11 = 2
Favourable cases for 12 as sum = 13 – 12 = 1
Probability = $\frac{(4+3+2+1)}{36} = \frac{10}{36} = \frac{5}{18}$
(iii) (d) Favourable cases = (1,1) (2,2) (3,3) (4,4) (5,5) (6,6) = 6
Probability = $\frac{6}{36} = \frac{1}{6}$
(iv) (b) Favourable cases = (2, 3) (2, 6) (4, 3) (4, 6) (6, 3) (6, 6) (3, 2) (3, 4) (3, 6) (6, 2) (6, 4) = 11
Probability = $\frac{11}{36}$

23. (c) No. of favourable cases
(2, 1)
(3, 1) (3, 2)
(4, 1) (4, 2) (4, 3)
(5, 1) (5, 2) (5, 3) (5, 4)
(6, 1) (6, 2) (6, 3) (6, 4) (6, 5) = 15
Probability = $\frac{15}{36} = \frac{5}{12}$

Note: Total cases = 36
There will be 6 such cases in which the same number (Doublet) will be obtained on both the dice. Out of the remaining 30 cases, there will be 15 such cases in which the first number will be bigger and 15 cases in which the second number will be bigger. In this way, the number of favourable cases can be obtained without writing all the cases.

24. (b) Sum is divisible by 2 or 4 means, sum can be 2, 4, 6, 8, 10, 12.
Favourable cases = (1 + 1, 1 + 3, 3 + 1, 2 + 2, 1+ 5, 5 + 1, 2 + 4, 4 + 2, 3 + 3, 2 + 6, 6 + 2, 3 + 5, 5 + 3, 4 + 4, 5 + 5, 6 + 4, 4 + 6, 6 + 6) = 18 cases
Probability = $\frac{18}{36} = \frac{1}{2}$

25. (d) Sum is divisible by 2 and 4 means, sum can be 4, 8, 12.
Favourable cases = (1 + 3, 3 + 1, 2 + 2, 2 + 6, 6 + 2, 3 + 5, 5 + 3, 4 + 4, 6 + 6) = 9 cases
Probability = $\frac{9}{36} = \frac{1}{4}$

26. (a) Total no. of cases = $6^2 = 36$
A : The sum of the numbers coming up is 9.
B : Occurrence of 5 on the first dice.
A : {(3, 6), (6, 3), (4, 5), (5, 4)}
B : {(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)}
$(A \cap B) = \{(5, 4)\}$
$P(A) = \frac{4}{36}$, $P(B) = \frac{6}{36}$ & $P(A \cap B) = \frac{1}{36}$
$\therefore P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1}{36} \times \frac{36}{6} = \frac{1}{6}$

27. (a) Total outcome = 6 × 6 = 36
Favorable outcomes = 4 i.e. {(3, 2), (2, 3), (4, 1), (1, 4)}
$P = \frac{4}{36}$

SMART APPROACH:-
Sum = 5
$\therefore P(\text{Sum } 5) = \frac{(5-1)}{36} = \frac{4}{36}$

28. (a) Total outcome = 36
Favorable outcomes = 10
i.e. [(1, 2) (2, 3) (3, 4) (4, 5) (5, 6), (2, 1) (3, 2), (4, 3) (5, 4), (6, 5)]
$\therefore P = \frac{10}{36} = \frac{5}{18}$

29. (a) Total outcome = 6 i.e. (1, 2, 3, 4, 5, 6)
Favorable outcomes = 3 i.e. (2, 4, 6)
$P = \frac{3}{6} = \frac{1}{2}$

30. (a) When we throw two dices sum 14 is not possible it means it is impossible event
So, P(A) = 0

31. (c) Total outcome = 36
Favorable outcomes = (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6), (2, 6), (3, 5), (5, 3), (6, 2) = 10
= 36 – 10 = 26
$P = \frac{26}{36} = \frac{13}{18}$

32. (b) Total number of possible cases when dice is cast twice = $6^2 = 36$
Possible outcomes of coins when tossed thrice = $2^3 = 8$
Probability = $\frac{1}{8 \times 36} = \frac{1}{288}$

33. No. of possible cases = 52
(i) (a) Probability = $\frac{4}{52} = \frac{1}{13}$
(ii) (c) Probability = $\frac{2}{52} = \frac{1}{26}$
(iii) (b) Probability = $\frac{12}{52} = \frac{3}{13}$
(iv) (a) Probability
$= \frac{(26+4-2)}{52} = \frac{28}{52} = \frac{7}{13}$
(v) (d) Probability = $\frac{2}{52} = \frac{1}{26}$

34. No. of possible cases = 52
(i) (b) $\frac{(4+4+4)}{52} = \frac{3}{13}$
(ii) (c) Heart = 13 & King = 4
Heart or King = 13 + 4 – 1 = 16
Probability = $\frac{(52-16)}{52} = \frac{9}{13}$
(iii) (d) Probability = $\frac{48}{52} = \frac{12}{13}$
(iv) (d) Probability = $\frac{2}{52} = \frac{1}{26}$

35. (d) Total no. of cards = 52
No. of cards removed = 4 × 2 = 8
∴ Remaining Cards = 52 – 8 = 44
Probability = $\frac{2}{44} = \frac{1}{22}$

36. (c) Probability

$$= \frac{{}^4C_1 + {}^4C_1}{{}^{52}C_1} = \frac{4+4}{52} = \frac{2}{13}$$

37. (d) Probability $= \frac{{}^4C_1 \times {}^4C_1 \times {}^4C_1}{{}^{52}C_3}$

$$= \frac{\frac{4\times4\times4}{1\times1\times1}}{\frac{52\times51\times50}{3\times2\times1}} = \frac{64}{22100} = \frac{16}{5525}$$

38. (i) (d) Probability $= \frac{{}^{12}C_3}{{}^{52}C_3}$

$$= \frac{\frac{12.11.10}{3.2.1}}{\frac{52.51.50}{3.2.1}} = \frac{11}{1105}$$

(ii) (b) P(atleast one king)

= 1 – P(No king)

$$= 1 - \frac{{}^{48}C_3}{{}^{52}C_3} = 1 - \frac{48.47.46}{52.51.50}$$

$$= 1 - \frac{4324}{5525} = \frac{1201}{5525}$$

39. (a) Probability $= \frac{{}^{26}C_2 \times {}^{26}C_1}{{}^{52}C_3}$

$$= \frac{\frac{26\times25}{2\times1}\times26}{\frac{52\times51\times50}{3\times2\times1}} = \frac{13}{34}$$

40. (i) (b) Probability $= \frac{26}{52}\times\frac{26}{52}\times\frac{26}{52} = \frac{1}{8}$

(ii) (d) Probability

$$= \frac{48}{52}\times\frac{48}{52}\times\frac{48}{52} = \frac{1728}{2197}$$

41. (b) Required probability

$$= \frac{4}{52}\times\frac{26}{52}\times\frac{20}{52} = \frac{5}{338}$$

42. (d) When, one card is black = ${}^{26}C_1$

When, one card is Red = ${}^{26}C_1$

A.T.Q.,

Total outcome = ${}^{52}C_2$

Favorable outcomes = ${}^{26}C_1 \times {}^{26}C_1$

$$P = \frac{{}^{26}C_1 \times {}^{26}C_1}{{}^{52}C_2} = \frac{26\times26}{26\times51} = \frac{26}{51}$$

43. (c) Total outcome = Total numbers between 33 and 92

= (92 – 33) + 1 = 59 + 1 = 60

Favorable outcomes = Total numbers of square numbers

= 4(36, 49, 64, 81)

$$P = \frac{4}{60} = \frac{1}{15}$$

44. (c) Total number of cards after removing king and queen of black colour = 52 – 4 = 48

Remaining spade card = 13 – 2 = 11

Required probability $= \frac{11}{48}$

45. (b) Total outcome = 52

Favorable outcomes (total face card) = 12

$$P = \frac{12}{52} = \frac{3}{13}$$

46. (c) Total outcome = 52

Favorable outcomes = 2

$$P = \frac{2}{52} = \frac{1}{26}$$

47. (d) $P = \frac{{}^4C_2}{{}^{52}C_2} = \frac{6}{26\times51} = \frac{2}{26\times17}$

$$= \frac{1}{13\times17} = \frac{1}{221}$$

48. (b) Total outcome = ${}^{52}C_2$

Favorable outcomes

$= {}^{13}C_1 \times {}^4C_1 - 1$

$$P = \frac{{}^{13}C_1 \times {}^4C_1 - 1}{{}^{52}C_2} = \frac{1}{26}$$

49. (a) Total outcome = 52

Favorable outcomes = (13 + 3) = 16

then,

$$P = \frac{16}{52} = \frac{4}{13}$$

50. (b) Total outcome = 52

Favorable outcomes = 4

then,

$$P = \frac{4}{52} = \frac{1}{13}$$

51. (c) Total outcome = 52

Favorable outcomes = 2

then,

$$P = \frac{2}{52} = \frac{1}{26}$$

52. (b) Total no. of outcomes = ${}^{52}C_2$

Favorable outcomes = ${}^{13}C_2$

then,

$$P = \frac{{}^{13}C_2}{{}^{52}C_2} = \frac{\frac{13\times12}{2}}{\frac{52\times51}{2}} = \frac{1}{17}$$

53. (c) Probability $= \frac{3+8}{21} = \frac{11}{21}$

54. (i) (b)

Bag – I	Bag – II
3 Red , 4 Black	5 Red, 2 Black

P (Both Red) $= \frac{3}{7}\times\frac{5}{7} = \frac{15}{49}$

P (Both Black) $= \frac{4}{7}\times\frac{2}{7} = \frac{8}{49}$

P (Same Colour) $= \frac{15}{49} + \frac{8}{49} = \frac{23}{49}$

(ii) (b) P(Different Colour)

= 1 – P(Same colour)

$$= 1 - \frac{23}{49} = \frac{26}{49}$$

55. (d) Probability $= \frac{{}^5C_3 + {}^4C_3 + {}^3C_3}{{}^{12}C_3}$

$$= \frac{10+4+1}{220} = \frac{15}{220} = \frac{3}{44}$$

56. (b) Probability $= \frac{{}^8C_2}{{}^{14}C_2} = \frac{4}{13}$

57. (b) Probability $= \frac{{}^5C_2}{{}^7C_2} = \frac{5.4}{7.6} = \frac{10}{21}$

58. (c) Probability $= \frac{{}^7C_1 + {}^3C_1}{{}^{15}C_1} = \frac{10}{15} = \frac{2}{3}$

59. (a) Probability $= \frac{{}^6C_2 \times {}^4C_1}{{}^{18}C_3} = \frac{5}{68}$

60. (a) Probability $= 1 - \frac{{}^8C_2}{{}^{10}C_2} = 1 - \frac{28}{45} = \frac{17}{45}$

61. (d) Probability $= \frac{{}^7C_3}{{}^{16}C_3} = \frac{1}{16}$

62. (b) Probability $= \frac{{}^3C_3 + {}^4C_3}{{}^7C_3} = \frac{1}{7}$

63. (d) Total no. of outcomes = ${}^{13}C_2$

Favorable outcomes = ${}^6C_1 \times {}^7C_1$

$$P = \frac{{}^6C_1 \times {}^7C_1}{{}^{13}C_2} = \frac{6\times7}{13\times6} = \frac{7}{13}$$

64. (b) Probability that both drawn balls are black

$$= \frac{10}{15}\times\frac{9}{14} = \frac{3}{7}$$

65. (a) Total balls = 7 i.e. (2 red , 3 green and 2 blue)

If we draw 2 balls and want no blue ball, that means the balls drawn must be either red or green.

Total outcomes = ${}^7C_2$

$$= \frac{7\times6}{1\times2} = 21$$

Favourable outcomes

$$= {}^5C_2 = \frac{5\times4}{1\times2} = 10$$

Required probability $= \frac{10}{21}$

66. (c) Total numbers = 20

Multiple of 3 between 1 and 20 = 6

Multiple of 5 between 1 and 20 = 4

Common multiple of 3 and 5

= 1 i.e. (15)

Favorable outcomes = 6 + 4 – 1 = 9

Required probability $= \frac{9}{20}$

67. (c) The probability that the ball will not be white $= \frac{5}{11}$

68. (b) Total number of balls = 30

Multiple of 4 between 1 and 30 = 7

Multiple of 6 = 5

Common multiple of 4 and 6

= 2(12, 24)

Favorable outcomes = 7 + 5 – 2 = 10

Required probability $= \frac{10}{30} = \frac{1}{3}$

69. (b) Favorable outcomes = 8

Total no. of outcomes = 14

$$P = \frac{8}{14} = \frac{4}{7}$$

70. (b) Total no. of outcomes = 15

Favorable outcomes = (4 + 5) = 9

$$P = \frac{9}{15} = \frac{3}{5}$$

71. (a) Total no. of outcomes = 21
Favorable outcomes = 7

$P = \frac{7}{21} = \frac{1}{3}$

72. (a) Total no. of outcomes = $^{10}C_3$
Favorable outcomes = $^4C_1 \times {}^6C_2$

$P = \frac{^4C_1 \times {}^6C_2}{^{10}C_3}$

$= \frac{\frac{4\times6\times5}{2}}{\frac{10\times9\times8}{3\times2}} = \frac{60}{120} = \frac{1}{2}$

73. (c) Total no. of outcome = $^{15}C_3$
Favorable outcomes = $^5C_3$

$P = \frac{\frac{5\times4\times3}{3\times2}}{\frac{15\times14\times13}{3\times2}} = \frac{60}{210\times13} = \frac{2}{7\times13} = \frac{2}{91}$

74. (a) Total no. of outcomes = $^{12}C_2$
Favorable outcomes = $^6C_2$

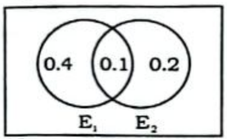
$P = \frac{^6C_2}{^{12}C_2} = \frac{\frac{6\times5}{2}}{\frac{12\times11}{2}} = \frac{30}{12\times11} = \frac{5}{22}$

75. (i) (c)
$P(E_1 \cup E_2) = P(E_1) + (E_2) - P(E_1 \cap E_2)$
$= 0.5 + 0.3 - 0.1$

$= 0.8 - 0.1 = 0.7$

and ⇒ $\cap$
or ⇒ $\cup$

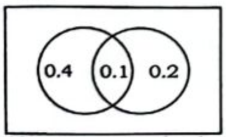
(ii) (b)
$P(E_1$ but not $E_2)$ means $P(E_1 \cap \overline{E_2})$
$= 0.4$



Alternate Method:

$= P(E_1 \cap \overline{E_2})$
$= P(E_1) - P(E_1 \cap E_2)$
$= 0.5 - 0.1 = 0.4$

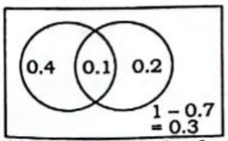
(iii) (a)
$P(E_2$ but not $E_1)$ means $P(E_2 \cap \overline{E_1})$
$= 0.2$



Alternate Method:

$= P(E_2 \cap \overline{E_1})$
$= P(E_2) - P(E_2 \cap \overline{E_1})$
$= 0.3 - 0.1 = 0.2$

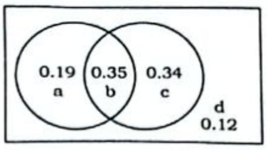
(iv) (d)
P(Neither E_1 nor E_2) means $P(\overline{E_1} \cap \overline{E_2})$
$= 1 - 0.7 = 0.3$



Alternate Method:

$P(\overline{E_1} \cap \overline{E_2}) = P(\overline{E_1 \cup E_2})$
$= 1 - P(E_1 \cup E_2)$
$= 1 - (0.5 + 0.3 - 0.1) = 0.3$

76. (i) (b)

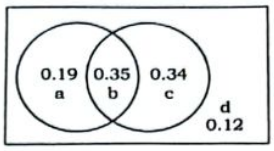


$P(A \cup B') = 0.19$

Alternate Method:

$= P(A \cap B')$
$= P(A) - P(A \cap B)$
$= 0.54 - 0.35 = 0.19$

(ii) (c)



$P(A' \cup B) = 0.34$

Alternate Method:

$= P(A' \cap B)$
$= P(B) - P(A \cap B)$
$= 0.69 - 0.35 = 0.34$

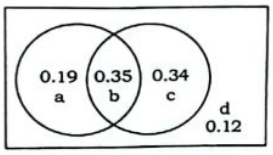
(iii) (d) $P(A' \cap B') = 1 - 0.19 + 0.35 + 0.34$
$= 1 - 0.88$
$= 0.12$

Alternate Method:

$= P(A' \cap B') = P(\overline{A \cup B})$

$= 1 - P(A \cup B) = P(\overline{A \cup B})$
$= 1 - 0.88 = 0.12$

(iv) (c)

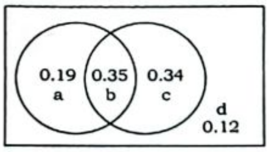


$P(A' \cup B)$
(L.CM) (Union)

$\left.\begin{array}{l} A' \to c+d \\ B \to b+c \end{array}\right] b+c+d$

$= 0.35 + 0.34 + 0.12 = 0.81$

(v) (a)

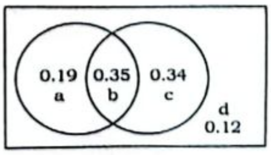


$P(A \cup B')$
(Union)

$\left.\begin{array}{l} A \to a+b \\ B' \to a+d \end{array}\right] \text{L.C.M} \Rightarrow a+b+d$

$= 0.19 + 0.35 + 0.12 = 0.66$

(vi) (b)



$P(A' \cup B')$
Union

$\left.\begin{array}{l} A' \to c+d \\ B' \to a+d \end{array}\right] \text{L.C.M} \Rightarrow a+b+d$

$= 0.19 + 0.34 + 0.12 = 0.65$

Alternate Method:

$= P(A' \cup B') = P(\overline{A \cap B})$

$= P(\overline{A \cap B}) = 1 - P(A \cap B)$
$= 1 - 0.35 = 0.65$

77. (b) We know,
$P(A \cup B) = P(A) + (P)B - P(A \cap B)$

$P(\overline{A} \cap \overline{B}) = P(\overline{A \cup B})$

$= 1 - P(A \cup B)$

$= 1 - \left[\frac{1}{4} + \frac{1}{2} - \frac{1}{8}\right] = 1 - \frac{5}{8} = \frac{3}{8}$

78. (b) We know,
$P(A \cup B) = P(A) + (P)B - P(A \cap B)$

$P(\overline{A} \cap \overline{B}) = P(\overline{A \cup B})$

$= 1 - P(A \cup B)$

$= 1 - \left[\frac{3}{8} + \frac{1}{2} - \frac{1}{4}\right] = 1 - \frac{5}{8} = \frac{3}{8}$

79. (c) $P(M) = 40\% = \frac{2}{5}$ & $P(B) = 30\%$

$= \frac{3}{10}$

$P(M \,\&\, B) = P(M \cap B) = 10\% = \frac{1}{10}$

$P(M \text{ or } B) = P(M \cup B)$
$= P(M) + P(B) - P(M \cap B)$

$= \frac{2}{5} + \frac{3}{10} - \frac{1}{10} = \frac{4+3-1}{10} = \frac{6}{10} = 0.6$

80. (d) Here, $P(A) = 0.8$, $P(B)$
$= 0.7$ & $P(A \cup B) = 0.95$
Now,
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$\Rightarrow 0.95 = 0.8 + 0.7 - P(A \cap B)$
$\Rightarrow P(A \cap B) = 1.5 - 0.95 = 0.55$

81. (b) $P(A) = 0.75$, $P(A \cap B) = 0.5$ &
P (Neither A nor B) = $P(A' \cap B') = 0.1$
We know that, $A' \cap B' = (A \cup B)'$
$\therefore P(A \cup B)' = 0.1$
$P(A \cup B) = 1 - P(A \cup B)'$
$= 1 - 0.1 = 0.9$
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$P(B) = 0.9 - 0.75 + 0.5 = 0.65$
∴ Probability of passing the Hindi examination = 0.65

82. $P(A) = \frac{30}{60} = \frac{1}{2}$ & $P(B) = \frac{32}{60} = \frac{8}{15}$

& $P(A \cap B) = \frac{24}{60} = \frac{2}{5}$

(i) (d) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{1}{2} + \frac{8}{15} - \frac{2}{5} = \frac{19}{30}$

∴ The probability that the selected students has opted for NCC or NSS is $\frac{19}{30}$.

(ii) (b) P(neither A nor B) = P(A' & B')
$= P(A' \cap B')$
& $A' \cap B' = (A \cup B)'$
$\therefore P(A' \cap B') = P(A \cup B)'$
$\Rightarrow P(A' \cap B') = 1 - P(A \cup B)$

$= 1 - \frac{19}{30} = \frac{11}{30}$

∴ The probability that the selected students has neither opted for NCC nor NSS is $\frac{11}{30}$

(iii) (a) Number of student of who have opted for NSS but not NCC

$n(B - A) = n(B) - n(A \cap B)$

$= 32 - 24 = 8$

$P(B - A) = \frac{8}{60} = \frac{2}{15}$

83. Here, $P(A) = 0.05$, $P(B) = 0.10$ & $P(A \cap B) = 0.02$

(i) (b) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 0.05 + 0.10 - 0.02 = 0.13$

$P(A' \cap B') = 1 - P(A \cup B) = 1 - 0.13$

$= 0.87$

(ii) (c) P (at least one of them will not qualify the examination)

= 1 − P (both of them will qualify)

$= 1 - P(A \cap B) = 1 - 0.02 = 0.98$

(iii) (d) Only one of them qualify

= (Anil will qualify & Ashmia will not) 'OR' (Anil will not qualify & Ashima will)

$= (A \cap B') \cup (A' \cap B)$

∴ Required probability

$= P(A) - P(A \cap B) + P(B) - P(A \cap B)$

$= P(A) + P(B) - 2 \times P(A \cap B)$

$= 0.05 + 0.10 - 2(0.02)$

$= 0.15 - 0.04 = 0.11$

84. (c) $M = \frac{3}{4}$, $(M \cap P) = \frac{13}{36}$

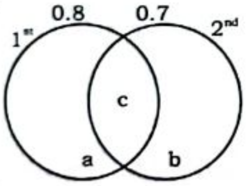
At least passes one exam $= (M \cup P) = \frac{5}{6}$

$= P(M \cup P) = P(M) + P(P) - P(M \cap P)$

$= \frac{5}{6} = \frac{3}{4} + P(P) - \frac{13}{36}$

$= P(P) = \frac{4}{9}$

85. (b)



Let,

1st only → exam = a

2nd only → exam = b

both → exam = c

A.T.Q,

$a + b + 2c = 0.7 + 0.8 = 1.5$

Given that $= a + b + c = 0.95$

then, $c = (1.5 - 0.95) = 0.55$

Alternate Method:

We know,

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 0.95 = 0.8 + 0.7 - P(A \cap B)$

$= P(A \cap B) = 0.55$

86. (b) $P(E \cap H) = 0.5$, $P(\overline{E} \cap \overline{H}) = 0.1$

$P(E) = 0.75$

Now, $\boxed{P(\overline{E} \cap \overline{H}) = 1 - P(E \cup H)}$

$P(\overline{E} \cap \overline{H}) = 0.1$

$= 1 - P(E \cup H) = 0.1$

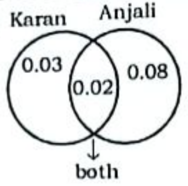
$= P(E \cup H) = 0.9$

$= P(E) + P(H) - P(E \cap H) = 0.9$

$= 0.75 + P(H) - 0.5 = 0.9$

$= P(H) = 0.65$

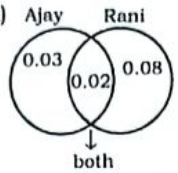
87. (a)



Required probability = 1 − 0.13

= 0.87

88. (a)

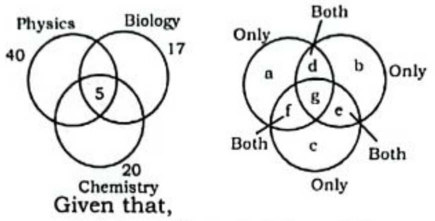


Required probability = 1 − 0.02

= 0.98

89. (d)

For understanding



Given that,

$a + b + c + (d + e + f) + g = 60$

$f + a + d + g + b + d + g + e + c + f + g + e = 77$

$60 + 2g + d + e + f = 77$

$2g + d + e + f = 17$

$d + e + f = 7$

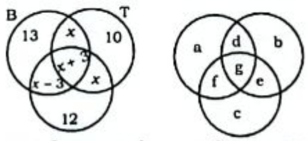
$a + b + c = 60 - 12 = 48$

Required probability

$= \frac{48}{60} = \frac{4}{5} = 0.80$

90. (c)

To understand



$a + b + c + d + e + f + g = 55$

$d + e + f + g = 20$

$x + x + x - 3 + x + 3 = 20$

$4x = 20 \Rightarrow x = 5$

Total no. of outcomes = 60

Favorable outcomes = 28

Then, $P = \frac{28}{60}$

91. The there, be m outcomes favourable to E and n outcomes unfavourable to E. Then,

$P(E) = \frac{m}{m+n} = \frac{3}{11}$

$[\because P(E) = \frac{3}{11} \text{ (given)}]$

$\Rightarrow m = 3$ and $n = 8$.

(i) (a) odds in favour of $E = \frac{m}{n} = \frac{3}{8}$

(ii) (a) odds against $E = \frac{n}{m} = \frac{8}{3}$

92. (b) Number of favourable outcome = 5

Number of unfavourable outcomes = 12

Total number of outcome = (5 + 12) = 17

Let E be the event. Then,

P(E)

$= \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

$= \frac{5}{17}$

93. (a) Let the given event be E and let $P(E) = x$. Then,

odds in favour of $E = \frac{P(E)}{1 - P(E)}$

$\Leftrightarrow \frac{P(E)}{1 - P(E)} = \frac{3}{5} \Leftrightarrow \frac{x}{(1 - x)} = \frac{3}{5}$

$5x = 3 - 3x \Leftrightarrow 8x = 3 \Leftrightarrow x = \frac{3}{8}$

∴ Required probability $= \frac{3}{8}$.

94. (b) Given,

$P(\text{against}) = \frac{\text{Against}}{\text{Favour}} = \frac{4}{7}$

$\frac{P(\overline{A})}{P(A)} = \frac{4}{7}, \frac{1 - P(A)}{P(A)} = \frac{4}{7}$

$7 - 7P(A) = 4P(A)$

$7 = 11P(A)$

$= P(A) = \frac{7}{11}$

95. (a) Favourable outcomes for the event = 4

Total number of outcome will be

$= (4 + 5) = 9$

Event which is not occur $= 1 - \frac{4}{9} = \frac{5}{9}$

96. (b) When a fair dice is tossed once, the sample space S is given by

$S = \{1, 2, 3, 4, 5, 6\}$

$\therefore n(S) = 6$

Let A = the event that number 3 or 4 turns up

$\therefore A = \{3, 4\}$

$\therefore n(A) = 2$

$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{2}{6} = \frac{1}{3}$

$\therefore P(A') = 1 - P(A) = \frac{2}{3}$

∴ Odds against event A = P(A') : P(A)

$= \frac{2}{3} : \frac{1}{3} = 2 : 1$

97. Let S be the sample space. Then, $n(S) = 36$.

(i) (b) Let E_1 be the event of getting the sum 5. then,

$E_1 = \{(1, 4), (2, 3), (3, 2), (4, 1)\} \Rightarrow n(E_1) = 4$.

$\therefore P(E_1) = \frac{n(E_1)}{n(S)} = \frac{4}{36} = \frac{1}{9}$

⇒ Odds in favour of E_1

$= \frac{P(E_1)}{1 - P(E_1)} = \frac{\left(\frac{1}{9}\right)}{\left(1 - \frac{1}{9}\right)} = \frac{1}{8}$

(ii) (c) Let E_2 be the event of getting the sum of 6. then,

$E_2 = \{(1, 5), (2, 4), (3, 3), (4, 2), (5, 1)\}$

$\Rightarrow n(E_2) = 5.$

$\therefore P(E_2) = \frac{n(E_2)}{n(S)} = \frac{5}{36}$

$\Rightarrow$ Odds against E_2

$= \frac{1-P(E_2)}{P(E_2)} = \frac{\left(1-\frac{5}{36}\right)}{\left(\frac{5}{36}\right)} = \frac{31}{5}$

98. (i) (a) Total outcomes = 52

Face cards (Queen, King, Jack)

$= 3 \times 4 = 12$

$P(\text{Against}) = \frac{\text{Favour}}{\text{Against}} = \frac{12}{40} = \frac{3}{10}$

(ii) (d) Total cards = 52

Spade = 13

$P(\text{Against}) = \frac{\text{Against}}{\text{Favour}} = \frac{39}{13} = \frac{3}{1}$

99. (d) Given, that $P(A) = \frac{11}{18}$

$\therefore P(\overline{A}) = 1 - \frac{11}{18} = \frac{7}{18}$

$\because P(A \cup B) = \frac{5}{9}$

$\therefore P(\overline{A} \cap \overline{B}) = 1 - \frac{5}{9} = \frac{4}{9}$

We know that,

$P(\overline{A} \cup \overline{B}) = P(\overline{A}) + P(\overline{B}) - P(\overline{A} \cap \overline{B})$

$\Rightarrow \frac{13}{27} = \frac{7}{18} + P(\overline{B}) - \frac{4}{9}$

$\therefore P(\overline{B}) = \frac{29}{54}$

$\therefore P(B) = 1 - \frac{29}{54} = \frac{25}{54}$

$\therefore \frac{P(\overline{B})}{P(B)} = \frac{29}{25}$

100. (a) I^{st} event

Against	Favour
$\frac{4}{9}$	$\frac{5}{9}$

IInd Event

Favour	Against
$\frac{3}{10}$	$\frac{7}{10}$

P (at least one) = 1 – No event

$= 1 - \frac{4}{9} \times \frac{7}{10}$

$= 1 - \frac{14}{45} = \frac{31}{45}$

101. $\frac{P(A')}{P(A)} = \frac{5}{2} \Rightarrow P(A) = \frac{2}{7}$ & $P(A') = \frac{5}{7}$

$\frac{P(B)}{P(B')} = \frac{6}{5} \Rightarrow P(B) = \frac{6}{11}$ & $P(B') = \frac{5}{11}$

(i) (a) P(atleast one event occurs)

$= P(A \cup B)$

$= P(A) + P(B) - P(A \cap B)$

$= P(A) + P(B) - P(A) \times P(B)$

Since both the events are independent therefore

$P(A \cap B = P(A) \times P(B)$

$= \frac{2}{7} + \frac{6}{11} - \frac{2}{7} \times \frac{6}{11} = \frac{22+42-12}{77} = \frac{52}{77}$

(ii) (b) P(None of the event occurs)

$= 1 - P(A \cup B)$

$= 1 - \frac{52}{77} = \frac{25}{77}$

102. (d) $\frac{P(X')}{P(X)} = \frac{8}{6} \Rightarrow P(X') = \frac{8}{14} = \frac{4}{7}$ &

$P(X) = \frac{6}{14} = \frac{3}{7}$

$\frac{P(Y)}{P(Y')} = \frac{14}{16} = \frac{7}{8} \Rightarrow P(Y) = \frac{7}{15}$ & $P(Y')$

$= \frac{8}{15}$

Required probability = $P(X' \cap Y')$

Since, X & Y are independent events. X' & Y' are also independent events.

Required probability $P(X' \cap Y') = P(X') \times P(Y')$

$= \frac{4}{7} \times \frac{8}{15} = \frac{32}{105}$

103. (a) I^{st} event

Against	Favour
$\frac{5}{7}$	$\frac{2}{7}$

IInd event

Favour	Against
$\frac{6}{11}$	$\frac{5}{11}$

$\therefore$ None of the Event $= \frac{5}{7} \times \frac{5}{11} = \frac{25}{77}$

104. (a) Person A

Favour	Against
$\frac{7}{16}$	$\frac{9}{16}$

Person B

Against	Favour
$\frac{5}{12}$	$\frac{7}{12}$

Atleast one = 1–No event

$= 1 - \frac{9}{16} \times \frac{5}{12}$

$= 1 - \frac{15}{64} = \frac{49}{64}$ $\begin{matrix}\rightarrow \text{success} \\ \rightarrow \text{Total}\end{matrix}$

$P(\text{Favour}) = \frac{\text{Favour}}{\text{Against}} = \frac{49}{15}$

105. (a) A

Against	Favour
$\frac{4}{7}$	$\frac{3}{7}$

B

Favour	Against
$\frac{7}{12}$	$\frac{5}{12}$

Solve = 1 – No event

$= 1 - \frac{4}{7} \times \frac{5}{12}$

$= 1 - \frac{5}{21} = \frac{16}{21}$ $\begin{matrix}\rightarrow \text{Favour} \\ \rightarrow \text{Total}\end{matrix}$

$P(\text{Favour}) = \frac{\text{Favour}}{\text{Against}} = \frac{16}{5}$

106. (a) $P(A|B) = \frac{(A \cap B)}{P(B)} = \frac{4}{13} \times \frac{13}{9} = \frac{4}{9}$

107. (i) (a) $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)} = \frac{0.2}{0.3} = \frac{2}{3}$

(ii) (b) $P\left(\frac{B}{A}\right) = \frac{P(A \cap B)}{P(A)} = \frac{0.2}{0.6} = \frac{1}{3}$

108. (a) $\frac{1}{2} = \frac{1}{6} \times \frac{P(B)}{1} \Rightarrow P(B) = \frac{1}{3}$

and, $\frac{1}{3} = \frac{1}{6} \times \frac{P(A)}{1} \Rightarrow P(A) = \frac{1}{2}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{1}{2} + \frac{1}{3} - \frac{1}{6} = \frac{5}{6} - \frac{1}{6} = \frac{2}{3}$

109. (a) $P(B | A \cup \bar{B}) = \frac{P(B \cap (A \cup \bar{B}))}{P(A \cup \bar{B})}$

$= \frac{P(A \cup B)}{P(A) + P(\bar{B}) - P(A \cap \bar{B})}$

$= \frac{P(A) - P(A \cap \bar{B})}{P(A) + P(\bar{B}) - P(A \cap \bar{B})}$

$= \frac{0.7 - 0.5}{0.8} = \frac{1}{4}$

110. (d) $S = \{(g, g), (g, b), (b, g), (b, b)\}$

E : both the children are boys

$E = \{(b, b)\} \Rightarrow P(E) = \frac{1}{4}$

& F : at least one of the children is a boy.

$F = \{(g, b), (b, g), (b, b)\}$

$\Rightarrow P(F) = \frac{3}{4}$ & $(E \cap F) = \{(b, b)\}$

$\Rightarrow P(E \cap F) = \frac{1}{4}$

Now, $P(E | F) = \frac{P(E \cap F)}{P(F)} = \frac{\frac{1}{4}}{\frac{3}{4}} = \frac{1}{3}$

111. (b) A : The number on the card drawn is even

B : The number on the card drawn is greater than 3

$S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{2, 4, 6, 8, 10\}$

$B = \{4, 5, 6, 7, 8, 9, 10\}$

$A \cap B = \{4, 6, 8, 10\}$

Also,

$P(A) = \frac{5}{10}, P(B) = \frac{7}{10}, P(A \cap B) = \frac{4}{10}$

$\therefore P(A | B) = \frac{P(A \cap B)}{P(B)} = \frac{4}{10} \times \frac{10}{7} = \frac{4}{7}$

112. (d) A : At least one girl will be chosen

B : Exactly 2 girls will be chosen

A' : No girl is chosen ⇒ 4 boys are chosen

$$P(A') = \frac{{}^{8}C_{1}}{{}^{12}C_{4}} = \frac{70}{495} = \frac{14}{99}$$

$$\Rightarrow P(A) = 1 - \frac{14}{99} = \frac{85}{99}$$

Now, $P(A \cap B) = P(2 \text{ boys } \& \text{ } 2 \text{ girls})$

$$= \frac{{}^{8}C_{2} \times {}^{4}C_{2}}{{}^{12}C_{4}} = \frac{6 \times 28}{495} = \frac{56}{125}$$

$P(B \mid A)$

$$= \frac{P(A \cap B)}{P(A)} = \frac{56}{165} \times \frac{99}{85} = \frac{168}{425}$$

113. (b) A : Getting a card with mark I in first draw.

B : Getting a card with mark I in second draw.

C : Getting a card with mark T in this draw.

$\therefore P(A \cap B \cap C)$

$= P(A) \times P(B \mid A) \times P(C \mid A \cap B)$

$$= \frac{5}{10} \times \frac{4}{9} \times \frac{5}{8} = \frac{5}{36}$$

114. (d) A and B are mutually exclusive events the, $P(A \cap B) = 0$

$P(A \cap B) = P(A) + P(B)$

$$P(A \cap B) = \frac{1}{3} + \frac{1}{4} = \frac{7}{12}$$

$1 - P(\bar{A} \cap \bar{B})$

$$1 - \frac{7}{12} = \frac{5}{12}$$

$$P(A \cap B) = \frac{5}{12}$$

115. (a) $P(A) = 0.2$

$P(A \cap B) = 0.3$

$P(A \cup B) = 1 - P(\bar{A} \cap \bar{B})$

$P(A \cup B) = 1 - 0.3 = 0.7$

A and B are mutually exclusive event then, $P(A \cap B) = 0$

$P(A \cup B) = P(A) + P(B)$

$0.7 = 0.2 + P(B)$

$= P(B) = 0.7 - 0.2 = 0.5$

$$= P(B) = 0.5 = \frac{1}{2}$$

116. (d) $2P(A) = 3P(B) = 4P(C) = 5P(D) = 60K$

$$P(A) = \frac{60K}{2} = 30K$$

$$P(B) = \frac{60K}{3} = 20K$$

$$P(C) = \frac{60K}{4} = 15K$$

$$P(D) = \frac{60K}{5} = 12K$$

Now, $(30K + 20K + 15K + 12K) = 77K$

$$= 77K = 1,\ K = \frac{1}{77}$$

$$77P(A) = 77 \times 30\frac{1}{77} = 30$$

$$A \cap B = \frac{4}{10} \times \frac{6}{10} = \frac{6}{25}$$

117. (d) $P(A) = 0.4,\ P(B) = 0.6.$

Both A and b are independent events.

$P(A \cap B) = P(A) \times P(B)$

$= 0.4 \times 0.6 = 0.24$

$P(A \text{ ro } B) = P(A \cup B)$

$= P(A \cup B) = 1 - P(A \cap B)$

$= 1 - 0.24 = 0.76$

118. (b) A and B are independent event

$P(A \cap B) = P(A) \times P(B)$

$$\frac{1}{6} = P(A) \times P(B)$$

Now,

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\frac{2}{3} = P(A) + P(B) - \frac{1}{6}$$

$$= P(A) + P(B) = \frac{5}{6}$$

$$\Rightarrow P(A) \times P(B) = \frac{1}{6},\ P(A) = \frac{1}{6P(B)}$$

$$\Rightarrow \frac{1}{6P(B)} + P(B) = \frac{5}{6}$$

$$= \frac{6B^2 + 1}{6B} = \frac{5}{6},\ 36B^2 - 30B + 6 = 0$$

$= 6B^2 - 5B + 1 = 0$

$$= B = \frac{1}{2}, \frac{1}{3} \Rightarrow P(A) \times P(B) = \frac{1}{6}$$

But, $B = \left(\frac{1}{2}, \frac{1}{3}\right)$

Given, $P(B) < P(A)$

$$= P(B) < P(A) = \frac{1}{3} < \frac{1}{2}$$

119. (a) A and B are independent event, then $P(A \cap B) = P(A) \times P(B)$

Now,

$P(A \cup B) = P(A) + P(B) - P(A) \times P(B)$

$0.7 = 0.4 + P - 0.4 \times P$

$0.7 = 0.4 + 0.6P$

$0.7 = 0.6P$

$$P = \frac{0.3}{0.6} = 0.5$$

120. (c) $P(A) = \frac{5}{8}$

$$P(B \mid A) = \frac{3}{7}$$

$P(A \cap B) = P(A) \times P(B \mid A)$

$$= \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$$

121. (c) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\frac{3}{4} = P(A) + \frac{1}{2} - \frac{1}{4}$$

$$P(A) = \frac{2}{4} = \frac{1}{2}$$

Now,

$P(A \cap B) = P(A) \times P(B)$

$$\frac{1}{4} = \frac{1}{2} \times \frac{1}{2}$$

Since, it's satisfy this condition

Hence, it is independent.

Note: Here, option (a) Not Mutually Exclusive should not have given.

122. (a) We know that:

$P(A \cup B) = 1 - P(A^c \cup B^c)$

$$P(A \cup B) = \frac{1}{6} = \frac{5}{6}$$

Also,

$$P(A) = 1 - P(A^c) = 1 - \frac{1}{4} = \frac{3}{4}$$

Using the formula:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\frac{5}{6} = \frac{3}{4} + P(B) - \frac{1}{4}$$

$$P(B) = \frac{5}{6} - \frac{3}{4} + \frac{1}{4} = \frac{5}{6} - \frac{2}{4} = \frac{5}{6} - \frac{1}{2} = \frac{1}{3}$$

Now, checking for independence:

$$P(A) \times P(B) = \frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4}$$

Since $P(A \cap B) = P(A) \times P(B)$, the events A and B are independent.

123. (b) Checking for mutual exclusivity:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$0.7\ 0.4 + 0.5 - P(A \cap B)$

$P(A \cap B) = 0.2$

Since $P(A \cap B) \neq 0$, events are not mutually exclusive.

124. (c) $P(\overline{A \cup B}) = \frac{1}{6}$,

$$P(\bar{A}) = 1 - QP(\bar{A}) = 1 - \frac{1}{4} = \frac{3}{4}$$

$$P(A \cup B) = 1 - \frac{1}{6} = \frac{5}{6}$$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\frac{5}{6} = \frac{3}{4} + P(B) - \frac{1}{4}$$

$$P(B) = \frac{1}{3} \Rightarrow P(A \cap B) = \frac{1}{4}$$

$$P(A) \times P(B) = \frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$$

We, know,

$P(A \cap B) = P(A) \times P(B)$

So, A and B are independent.

A and B are not equally likely.

125. (b) $P(A \cup B) = 1 - P(A \cup B)^c = 1 - \frac{1}{4} = \frac{3}{4}$

$$P(A) = 1 - P(A^c) = 1 - \frac{1}{2} = \frac{1}{2}$$

Using Union Formula:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\frac{3}{4} = \frac{1}{2} + P(B) - \frac{1}{5}$$

$$P(B) = \frac{3}{4} - \frac{1}{2} + \frac{1}{5} = \frac{9}{20}$$

Checking for Independence:

$$P(A \cap B) = P(A) \times P(B) = \frac{1}{2} \times \frac{9}{20} = \frac{9}{40}$$

Since $P(A \cap B) = \frac{1}{5} = \frac{8}{40} \neq \frac{9}{40}$, the events are not independent.

Checking for Equally Likely Condition:

Since $P(A) = \frac{1}{2} \neq P(B) = \frac{9}{20}$, the events are not equally likely.

126. (a) A : The event of drawing a red ball
E_1 : Choosing the bag I
E_2 : Choosing the bag II
We know that the probability of choosing a ball is $\frac{1}{2}$, i.e., $P(E_1)$

$= P(E_2) = \frac{1}{2}$

P(Drawing a red ball from bag I)

$= P(A|E_1) = \frac{7}{11}$

P(Drawing a red ball from bag II)

$= P(A|E_2) = \frac{5}{14}$

We need to determine the value of P(the ball drawn from the bag I given that it is a red ball), that is $P(E_1|A)$.

$$P(E_1|A) = \frac{P(A|E_1) \times P(E_1)}{P(A|E_1) \times P(E_1) + P(A|E_2) \times P(E_2)}$$

$$= \frac{\frac{7}{11} \times \frac{1}{2}}{\frac{7}{11} \times \frac{1}{2} + \frac{5}{14} \times \frac{1}{2}} = 0.64$$

127. (a) E_1 : Box I is selected
E_2 : Box II is selected
E_3 : Box III is selected
A : White ball is drawn
$P(E_1) = 0.2$, $P(E_2) = 0.3$ & $P(E_3) = 0.5$
$P(A|E_1)$ = Probability of white ball from box I $= \frac{2}{5}$
$P(A|E_2)$ = Probability of white ball from box II $= \frac{4}{6}$
$P(A|E_3)$ = Probability of white ball from box III $= \frac{1}{4}$

$$P\left(\frac{E_1}{A}\right) = \frac{P(E_1) \times P\left(\frac{A}{E_1}\right)}{P(E_1) \times P\left(\frac{A}{E_1}\right) + P(E_2) \times P\left(\frac{A}{E_2}\right) + P(E_3) \times P\left(\frac{A}{E_3}\right)}$$

$$= \frac{0.2\left(\frac{2}{5}\right)}{(0.2)\left(\frac{2}{5}\right) + (0.3)\left(\frac{4}{6}\right) + (0.5)\left(\frac{1}{4}\right)}$$

$$= \frac{\frac{4}{50}}{\frac{243}{600}} = \frac{16}{81}$$

128. (c) A : The event that dice is 6 after throwing
E_1 : The event that 6 occurs
E_2 : The event that 6 doesn't occurs

$P(E_1) = \frac{1}{6}$ & $P(E_2) = 1 - \frac{1}{6} = \frac{5}{6}$

$P(A|E_1)$ = Probability when man reports that actually 6 has occurred and when is true $= \frac{3}{4}$

$P(A|E_2)$ = Man reports that 6 has occurred and that has not occurred

$= 1 - \frac{3}{4} = \frac{1}{4}$

By Baye's theorem

$P(E_1|A)$

$$= \frac{P(E_1).\,P(A|E_1)}{P(E_1) \times P(A|E_1) + P(E_2) \times P(A|E_2)}$$

$$= \frac{\frac{1}{6} \times \frac{3}{4}}{\frac{1}{6} \times \frac{3}{4} + \frac{5}{6} \times \frac{1}{4}} = \frac{3}{8}$$

129. (b) A : Event that the man reports that king is drawn from the pack of cards
E_1 : King is drawn
E_2 : King is not drawn

$P(E_1) = \frac{1}{4}$ & $P(E_2) = \frac{3}{4}$

$P(A|E_1)$ = Probability that the man says the truth that king is drawn when actually king is drawn

$= \frac{3}{4}$

$P(A|E_2)$ = Probability that the man says the truth that king is drawn when actually king is not drawn

$= 1 - \frac{3}{4} = \frac{1}{4}$

$P(E_1|A)$

$$= \frac{P(E_1).\,P(A|E_1)}{P(E_1) \times P(A|E_1) + P(E_2) \times P(A|E_2)}$$

$$= \frac{\frac{1}{4} \times \frac{3}{4}}{\frac{1}{4} \times \frac{3}{4} + \frac{1}{4} \times \frac{3}{4}} = \frac{3}{16} \times \frac{16}{6} = \frac{1}{2} = 0.50$$

130. (d) Probability of hit the target

$= \frac{2}{3} \times \frac{1}{4} + \frac{1}{3} \times \frac{3}{4} = \frac{5}{12}$

131. (a) Probability that atleast one of them pass the exam
$= 1 -$ P(No body pass)

$= 1 - \frac{1}{3}.\frac{1}{4} = 1 - \frac{1}{12} = \frac{11}{12}$

132. (c) P(Solved) = 1 − P(Not solved)

$= 1 - \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} = 1 - \frac{1}{4} = \frac{3}{4}$

133. (d) Probability of hit the target

$= \frac{2}{3} \times \frac{1}{4} + \frac{1}{3} \times \frac{3}{4} = \frac{5}{12}$

134. (a) P(Solved) = 1 − P (Not solved)

$= 1 - \frac{4}{7}.\frac{4}{9}.\frac{4}{5} = 1 - \frac{64}{315} = \frac{251}{315}$

135. (d) Probability $= \frac{1}{7} \times \frac{4}{5} + \frac{6}{7} \times \frac{1}{5}$

$= \frac{10}{35} = \frac{2}{7}$

136. (c) Probability $= \frac{1}{5} \times \frac{2}{3} + \frac{4}{5} \times \frac{1}{3}$

$= \frac{2}{15} + \frac{4}{15} = \frac{6}{15} = \frac{2}{5}$

137. (d) Probability

$= \frac{3}{4} \times \frac{1}{5} + \frac{1}{4} \times \frac{4}{5} = \frac{7}{20}$

138. (b) Probability

$= \frac{5}{7} \times \frac{1}{9} + \frac{2}{7} \times \frac{8}{9} = \frac{21}{63} = \frac{1}{3}$

139. (c) Let event A : A speaks the truth, event B : B speaks the truth.

$\therefore P(A) = \frac{80}{100} = \frac{4}{5}$ and P(B)

$= \frac{60}{100} = \frac{3}{5}$

$\therefore P(A') = 1 - P(A) = 1 - \frac{4}{5} = \frac{1}{5}$

and, $P(B') = 1 - P(B) = 1 - \frac{3}{5} = \frac{2}{5}$

∴ P(A and B contradict each other)
= P(A speaks the truth and B lies) + P (A lies and B speaks the truth
$= P(A \cap B') + P(A' \cap B)$
$= P(A)\,P(B') + P(A')\,P(B)$

$= \left(\frac{4}{5} \times \frac{2}{5}\right) + \left(\frac{1}{5} \times \frac{3}{5}\right) = \frac{8}{25} + \frac{3}{25} = \frac{11}{25}$

140. (d) Probability

$= \frac{5}{7} \times \frac{1}{9} + \frac{2}{7} \times \frac{8}{9} = \frac{21}{63} = \frac{1}{3}$

141. (c)

A	B
$(P)\frac{3}{4}$	$(P)\frac{4}{5}$
$(\bar{P})\frac{1}{4}$	$(\bar{P})\frac{1}{5}$

they will contradict each other →

$\frac{3}{4} \times \frac{1}{5} + \frac{4}{5} \times \frac{1}{4} = \frac{3}{20} + \frac{1}{5} = \frac{7}{20} \times 100 = 35\%$

142. (a) $P(T) \to \frac{3}{5}$, $P(\bar{T} \to \frac{2}{5}$

$P(1) \to \frac{1}{6}$, $P(\bar{1}) \to \frac{5}{6}$

Total no. of outcome $= \frac{3}{5} \times \frac{1}{6} + \frac{2}{5} \times \frac{5}{6}$

Favorable outcomes $= \frac{3}{5} \times \frac{1}{6}$

Then, $P = \frac{\frac{1}{10}}{\frac{1}{10} + \frac{1}{3}} = \frac{30}{10 \times 13} = \frac{3}{13}$

143. (d) $P(T) \to \frac{2}{3}$, $P(\bar{T}) \to \frac{1}{3}$

$P(\text{even}) \to \frac{3}{7}$ $P(\overline{\text{even}}) \to \frac{4}{7}$

Total no. of outcomes $= \frac{2}{3} \times \frac{3}{7} + \frac{1}{3} \times \frac{4}{7}$

Favorable outcomes $= \frac{2}{3} \times \frac{3}{7}$

Then, $p = \frac{\frac{2}{7}}{\frac{2}{7} + \frac{4}{21}} = \frac{2 \times 21}{7 \times 10} = \frac{3}{5}$

144. (c) $P(A) = \frac{3}{7}$ $P(\bar{A}) = \frac{4}{7}$

$P(B) = \frac{5}{9}$ $P(\bar{B}) = \frac{4}{9}$

$P(C) = \frac{1}{5}$ $P(\bar{C}) = \frac{4}{5}$

$P = 1 - \frac{4}{7} \times \frac{4}{9} \times \frac{4}{5} = \frac{315 - 64}{315} = \frac{251}{315}$

145. (a) Probability of not selecting Sudarshan

$= 1 - \frac{1}{3} = \frac{2}{3}$

Probability of not selecting Abraham

$= 1 - \frac{1}{5} = \frac{4}{5}$

∴ Probability that none of them is selected

$= \frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

146. (b) Probability

$= \frac{1}{4} + \frac{1}{5} + \frac{1}{6} = \frac{15 + 12 + 10}{60} = \frac{37}{60}$

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147. (c) $\frac{29}{32}$

P(Problem is solved) = 1 − P (Problem not solved)

$$\frac{29}{32} = 1\left\{\frac{1}{2} \times \frac{2}{3} \times (1 - P)\right\}$$

$$\frac{29}{32} = 1\left\{\frac{2}{6} \times (1 - P)\right\}$$

$$\frac{29}{32} = \frac{6 - 2 + 2P}{6}$$

$$P = \frac{23}{32}$$

148. (a) Multiple of 3 = $\frac{99}{3} = 33$

Multiple of 5 = $\frac{100}{5} = 20$

Multiple of both 3 & 5 = $\frac{90}{15} = 6$

∴ Total no. of probable conditions
= 33 + 20 − 6 = 47

Probability = $\frac{47}{100}$

149. (c) Probability

$$= \frac{^{5}C_2}{^{26}C_2} = \frac{5.4}{26.25} = \frac{2}{65}$$

150. (a) AA   SSS
SSS   TTT
I   A
TT   II
N   C

Probability = $\frac{2}{9} \times \frac{1}{10} + \frac{3}{9} \times \frac{3}{10} + \frac{1}{9} \times \frac{2}{10} + \frac{2}{9} \times \frac{3}{10} = \frac{19}{90}$

151. (i) (a) Leap year = 366 days
= 52 weeks + 2 days

Since in a leap year 52 weeks are there, hence
P(atleast 52 Sundays) = 1

(ii) (c) Remaining 2 days can be = MT, TW, WTh, TF, FS P(exactly 52 Sundays) = $\frac{5}{7}$

(iii) (d) P(exactly 53 Sundays) = $\frac{2}{7}$

152. (d) P(at least one girls)
= 1 − P(No girls)

$$= 1 - \frac{^{8}C_2}{^{17}C_2} = 1 - \frac{8.7}{17.16} = \frac{27}{34}$$

153. (a) Total no. of outcomes = $^{25}C_3$
Favorable outcomes = $^{15}C_2 \times {}^{10}C_1$
then,

$$P = \frac{^{10}C_1 \times {}^{15}C_2}{^{25}C_3} = \frac{\frac{15 \times 14 \times 10}{2}}{\frac{25 \times 24 \times 23}{3 \times 2}}$$

$$= \frac{15 \times 14 \times 5}{25 \times 4 \times 23} = \frac{3 \times 7}{2 \times 23} = \frac{21}{46}$$

154. (a)

	A	O
D	3	5
N	7	15

$$\frac{^{20}C_2 + {}^{22}C_2 - {}^{15}C_2}{^{30}C_2} = \frac{190 + 231 - 105}{435} = \frac{316}{435}$$

155. (d) Probability that more than one vowel

$$= \frac{^{4}C_2 \times {}^{5}C_1 + {}^{4}C_3}{^{9}C_3} = \frac{17}{42}$$

156. (a) Total no. of outcomes = $^{5}C_3$
Favorable outcomes = $^{3}C_1$
then,

$$P = \frac{^{3}C_1}{^{5}C_3} = \frac{3}{\frac{5 \times 4 \times 3}{3 \times 2}} = \frac{3}{10}$$

157. (c) Total no. of outcomes = 9
Favorable outcomes
= (1×1), (1×4), (2×1), (2×4), (3×1)
= 5

then, P = $\frac{5}{9}$

158. Let, A = Event that man who is 45 will be alive till age 70
B = Event that wife who is 40 will be alive till age 65

It is given that, $P(A) = \frac{5}{12}$, $P(B) = \frac{3}{8}$

$$\therefore P(A') = 1 - P(A) = 1 - \frac{5}{12} = \frac{7}{12}$$

$$\therefore P(B') = 1 - P(B) = 1 - \frac{3}{8} = \frac{5}{8}$$

Since A and B are independent events,
A' and B' are also independent events.

(i) (d) Let Event C: Both man and his wife will be alive.

$$\therefore P(C) = P(A \cap B) = P(A).P(B)$$

$$= \frac{5}{12} \times \frac{3}{8} = \frac{5}{32}$$

(ii) (c) Let Event D: Exactly one of them will be alive.

$$\therefore P(D) = P(A' \cap B) + P(A \cap B')$$
$$= P(A') . P(B) + P(A). P(B')$$

$$= \left(\frac{7}{12} \times \frac{3}{8}\right) + \left(\frac{5}{12} \times \frac{5}{8}\right)$$

$$= \frac{21}{96} + \frac{25}{96} = \frac{46}{96} = \frac{23}{48}$$

(iii) (d) Let Event E: None of them will be alive.

$$\therefore P(E) = P(A' \cap B') = P(A').P(B')$$

$$= \frac{7}{12} \times \frac{5}{8} = \frac{35}{96}$$

(iv) (a) Let Event F : At least one of them will be alive.

∴ P(F) = 1 − P(none of them will be alive)

$$= 1 - \frac{35}{96} = \frac{61}{96}$$

159. (a) Direct shortcut
$^{n}C_r (P)^r (1 - P)^{n-r}$

$P(\text{Hit}) = \frac{5}{8}$, $P(\text{not hit}) = \frac{3}{8}$

$$\text{Probability} = {}^{10}C_2 \left(\frac{5}{8}\right)^2 \left(\frac{3}{8}\right)^8$$

$$= \frac{10 \times 9}{2 \times 1} \times \frac{5^2}{8^2} \times \frac{3^8}{8^8}$$

$$= \frac{1125 \times 3^8}{8^{10}}$$

160. (a) Direct shortcut
$^{n}C_r (P)^r (1 - P)^{n-r}$

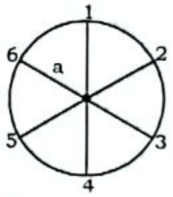
$P(\text{Head}) = \frac{2}{5}$

$P(\text{not head}) = \frac{3}{5}$

$$\text{Probability} = {}^{10}C_3 \left(\frac{2}{5}\right)^3 \left(\frac{3}{5}\right)^7$$

$$= \frac{10 \times 9 \times 8}{3 \times 2 \times 1} \times \frac{2^3 \times 3^7}{5^{10}} = \frac{2^6 \times 3^8}{5^9}$$

161. (c)



ATQ,
Total no. of outcome = 36
Favorable outcomes = (6,1),(6,2) (6,3) (6,3), (6,4), (6,5)(5,1), (5,2), (5,3), (5,4), (4,1), (4,2), (4,3)
(3,1), (3,2), (2,1) = 15

$$P = \frac{15}{36} = \frac{5}{12}$$

162. (c)

$$\underset{\text{Red}}{x} \quad \underbrace{\underset{\text{Black}}{y} \quad \underset{\text{Yellow}}{(9-y)}}_{9}$$

$$P_{\text{Red}} = \frac{^{x}c_2}{^{(9+x)}c_2} = \frac{1}{7}$$

$$\Rightarrow \frac{x(x-1)}{(9+x)(8+x)} = \frac{1}{7}$$

$x = 6$

$$\frac{^{y}c_2}{^{15}c_2} \times \frac{5}{2} = \frac{1}{7}$$

$$\Rightarrow \frac{y(y-1)}{15 \times 14} = \frac{2}{35}$$

$\Rightarrow y(y-1) = 12$
$y = 4$
∴ Yellow = 9 − 4 = 5

◆